Rock Products

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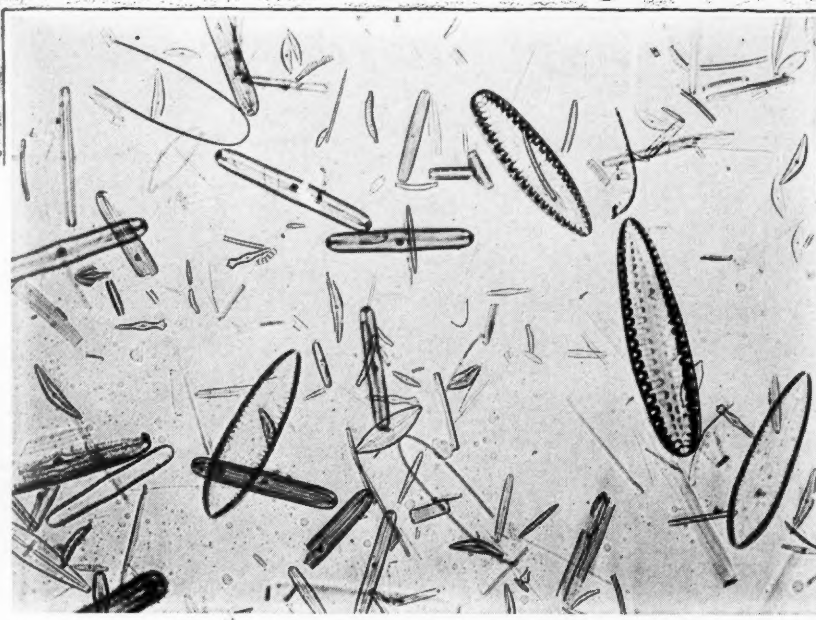
Specimens of diatomaceous earth from Virginia, taken at a magnification of approximately 335 diameters. The large discoid diatoms shown belong to the species Coscinodiscus, and the "step-ladder" type is one of the Melosira species

Diatomaceous

By Elliott



Specimen of diatomaceous earth from Scotland deposits, taken at an enlargement of 150 diameters. The oval-shaped diatoms shown belong to the species Surirella

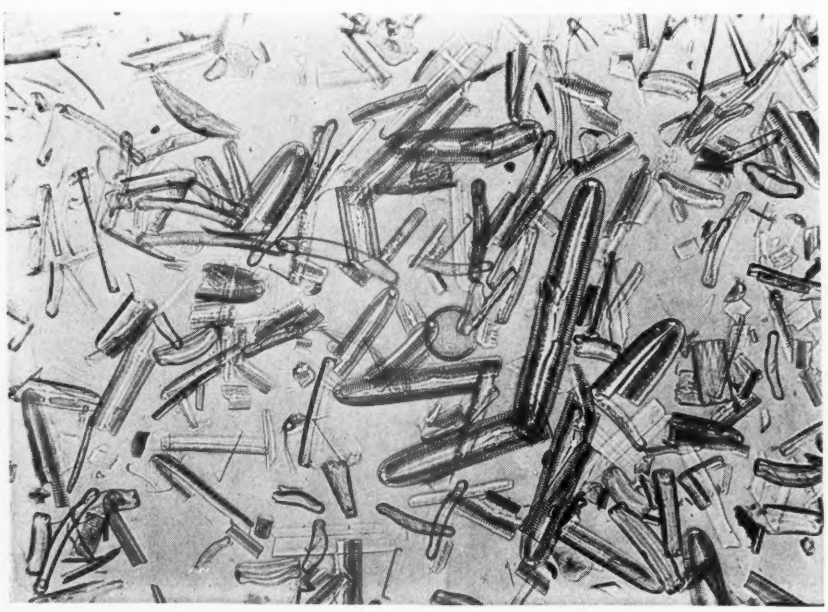
Editor's Note

THE AUTHOR of this article is a member of the firm of Carman and Hastings, consulting engineers, Los Angeles, Calif. He has recently completed a very extensive study and survey of the diatomaceous earth industry.

—The Editor.

THE TERM DIATOMACEOUS EARTH, as generally accepted, is applied to the siliceous remains of Diatomaceae, a species of minute, flowerless aquatic plants of the order Algae, and more accurately defines and describes the material than other terms now in use, such as kieselguhr, infusorial earth, diatomite, desmid earth, moler, bergmehl, tripolite, polirschiefer, celite, and others that have acquired significance through their use as trade names of local products.

The diamtomaceae live in all kinds of water, still, running, hot or cold, saline, brackish or fresh, and under all kinds of pressure conditions. The minute organisms assimilate inorganic salts from their surroundings and form a skeleton structure of silica which serves as a support for the gelatinous mass of the living diatom. In addition to being very prolific, their life span is short, and as they die, their remains sink to the bottom together with other materials, such as sand, clay, or volcanic ash, that may be present, and the organic matter gradually disappears by decomposition, leaving only the siliceous skeletons interbedded with the inorganic matter present at the time of sedimentation.



Specimen of diatomaceous earth from Canada, taken at a magnification of 150 diameters. The long, slender type diatoms shown as prevailing in this material are known as the Navicula

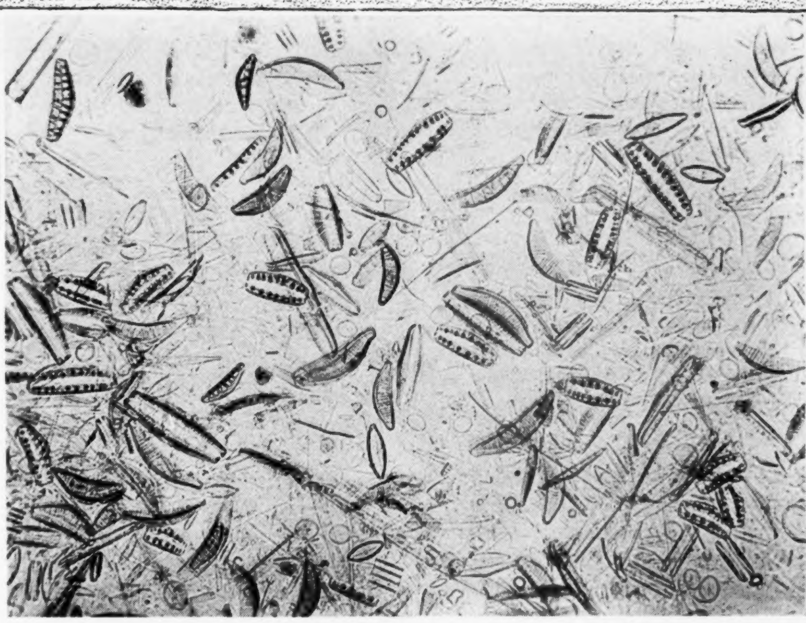
Diatomaceae, as a form of cellular life, have existed for unknown ages with practically no change in structure; diatomaceous earth material from commercial deposits dates back to the Pliocene and Pleistocene Ages, some nineteen million years ago, while living diatoms are being gathered at the present time of identical structure and character. One of the accompanying photomicrographs shows this very clearly.

There are countless varieties of diatomaceae, over eight thousand distinct forms having been described and classified at the present time, varying in size from species easily visible to the naked eye to species so minute that they are visible under the microscope only by using very high magnifications; these forms are of countless shapes, dimensions and characters.

As a useful nonmetallic mineral, diatomaceous earth is one of the oldest known to man. Its extreme lightness of weight was recognized by the Romans in the fourth century, who termed it the "floating

Earth Nature's Most Minute Rock Product

S. Hastings



Specimen of diatomaceous earth from Utah, taken at a magnification of 150 diameters. Note the variety of species present. The species occurring most frequently in this material is known as the Epithemia

stone" and used it in building operations.

Use in Industry

From that time until the latter part of the eighteenth century little is known of the use of this material, but the close of the eighteenth century marked the beginning of the utilization of the material in industry. It had been discovered that the material was very refractory and a poor conductor of heat, so that its use was in industries where such characteristics were valuable.

From that time until the present, diatomaceous earth has been used in various industrial fields in a more or less limited manner, due as much to the lack of authentic information and data regarding the material itself and its suitability for various commercial applications as to the condition of the industries themselves. The present state of industry, with its keen competition, rapid growth and ever-growing necessity for economy and efficiency, has developed an interest in diatomaceous earth, its composition and characteristics, entirely out of proportion to the technical data and information available as to its suitability for commercial uses.

While the history and character of the deposits of diatomaceous earth over the world is a fascinating study in itself, and one in which much pioneering must be done, this phase will be covered by the statement that such deposits exist in all parts of the world, practically, with each area being distinguished by material of special characteristics that differentiate it from other areas. To the geologist, these characteristics afford much data on the life history of the earth, as the deposits of massive characteristics contain the fossil remains of flora and fauna of the period of sedimentation in well-preserved condition.

Relatively Few Commercial Deposits

While the material has an almost universal distribution over the surface of the earth, relatively few of the deposits are of proper location as regards transportation, or are of sufficient size and purity, to be of value for commercial exploitation. The most important deposits are found in the countries of North, Central and South America, New Zealand, Barbados Islands, Scotland, Africa, Germany, Canada, Nova Scotia and Ireland.

Of the countries mentioned, the United States ranks first as a producer of diatomaceous earth and its products, Germany and Africa ranking next in importance. In the United States deposits are found in the states of Washington, Oregon, California, Missouri, Nevada, Illinois,

Specimen of diatomaceous earth from Arizona, taken at a magnification of 150 diameters. The few whole diatoms shown in the photograph belong to the species Navicula

New York, Maryland, Virginia, New Hampshire, Massachusetts and Connecticut.

As a rule the more massive deposits are found in the western states, the deposits in the eastern states being of less depth and extent, and intermingled with sand and clay sedimentations. At present the largest single producer of diatomaceous earth and its products is located in Santa Barbara county, Calif., with other important producers located in other parts of this state, as well as the states of Oregon, Washington and Nevada.

Diatomaceous earth is a material composed largely of silica in the amorphous state, varying from pure white in color to brown, usually soft and easily abraded. Being highly absorbent, the material in its natural state usually carries from 25% to 45% moisture, and is ordinarily found more or less intimately intermingled with the impurities previously mentioned. The character of these impurities is one of the factors determining the commercial importance of the deposits.

Chemical and Physical Requirements

Diatomaceous earths now in commercial use are of widely varying chemical composition. According to Goodwin, the limits of variation for a commercial material are:

Silica	65.00 to 95.00%
Iron and aluminum oxides	8.00 to .20%
Lime and magnesia	7.00 to .10%
Potassium, sodium oxides	5.00 to .00%
Water, organic matter	15.00 to 4.00%

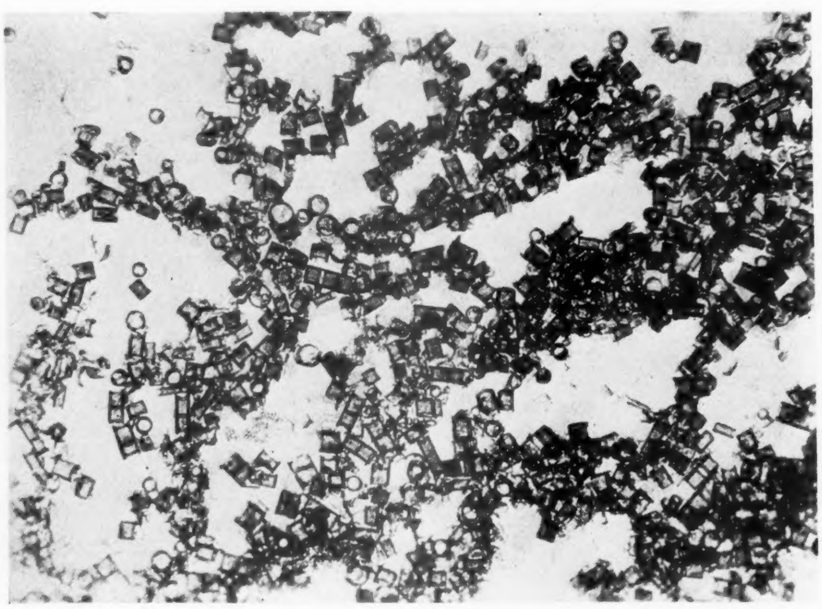
Few, if any, of the deposits now being exploited commercially fail to meet the above requirements, so that the relative superiority of a material for general use is determined mainly by the structure of the material and its physical characteristics.

Since the general physical and chemical characteristics which make diatomaceous earth of great industrial importance have been frequently enumerated and discussed by authorities, the more important properties will be enumerated here by simply stating that the distinguishing physical characteristics are those of very light weight as compared to other sedimentary materials, great porosity with resultant high absorptive power, large surface areas in comparison to average particle diameters, and low compressive strength. The outstanding chemical characteristics are the siliceous, inorganic nature of the material, its solubility in alkaline solutions, and non-solubility in acid or neutral solutions, with the exception of hydrofluoric acid.

To meet commercial requirements, diatomaceous earth is supplied in the form of natural or calcined blocks, cut to size and shape desired; in powder form either crude or calcined, graded as to size, color and relative freedom from impurities, depending upon the application of the material.

Uses for Filtration Media

The use of diatomaceous earth as a filtration and clarification agent is at present one of the most important industrial applications of the material. In this field the extreme porosity of the material plays an important part, as does the area of surface exposed. While the use of diatomaceous earth in filtration processes is extensive as a rule, it is the writer's observation that not enough attention has been given to the character of the material as regards uniformity of particle size and surface exposures to secure the greatest commercial benefits from the filtering and clarifying operations. Such factors as purity of color, freedom from impurities and screen sizes have been adequately considered, but when substituting diatomaceous earth material for some other filtration agent the process has not, as a rule, been adjusted to take advantage of the peculiar properties of the material to the fullest extent.



Specimen of diatomaceous earth from Nevada, taken at a magnification of 150 diameters. The material shown is of unusual uniformity, and is composed of one type of diatom, the Melosira

Accurate data on filtration and clarification processes, and the behavior of various types of diatomaceous earth in such processes is not generally available to those interested, and such failures of diatomaceous earths to function satisfactorily as have come to the attention of the writer have been due either to improper adjustment of the filtration process or to the use of material unsuited for the work. In these instances the trouble was corrected by the selection of the proper diatomaceous earth material and by slightly changing plant processes, with immediate and marked improvement in plant operation.

Vast Field in Colloidal Chemistry

There is a vast field yet to be explored as regards the behavior of diatomaceous earths because of their colloidal contents and their ionization effects on solutions. No data can be published at present concerning this, but the investigations promise much of interest because of the present controversial nature of theories regarding colloids and colloidal solutions.

As a thermal insulator diatomaceous earth ranks very high on account of the myriads of minute enclosed air cells within the structure. These cells contain air, and, being entirely enclosed by silica, in itself an inert, refractory material, offer an excellent barrier to the transfer of heat. While diatomaceous earth at temperatures lower than 200 deg. F. is not quite as effective as some organic materials, it has the advantage of permanence and freedom from decomposition and disintegration, and has few superiors for temperatures ranging from 200 to 2000 deg. F.

Relative Insulating Values

The following table shows the relative conductivity of some organic and inorganic materials at approximately 90 deg. C. Conductivity expressed in calories transferred per second per square centimeter per degree Centigrade:

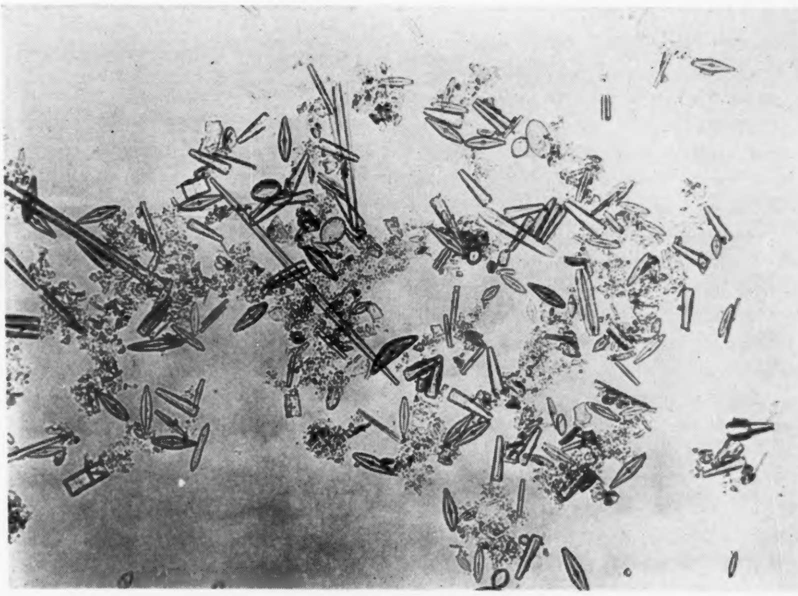
Air alone	0.0018
Felt	0.00040
Wool	0.00031
Magnesia	0.00047
Asbestos	0.00186
Diatomaceous earth No. 1	0.00055
Diatomaceous earth No. 2	0.00032
Diatomaceous earth No. 3	0.00025
Diatomaceous earth No. 4	0.00050
Diatomaceous earth No. 5	0.00038

In this particular field color of material is not as important a requirement as in filtration, since impurities are not as objectionable. As a rule, color of the natural material is taken as a more or less

workable index of the purity of the material; lightness of weight and porosity are the main requirements for a satisfactory insulating material, these qualities indicating the fineness of particle sizes and amount of dead air space existent.

As a Refractory

Certain limitations are imposed upon the use of diatomaceous earth as a refractory material by reason of its low mechanical strength. In applications where strength comparable to that of the average fire-brick is required, a mixture of diatomaceous earth and clay can be made, but this mixture is made at the expense of the full insulative properties of the diatomaceous earth. When properly adjusted to the insulative conditions and requirements there are few, if any, materials of equal value. In some special cases a vacuum was found to be its only superior.

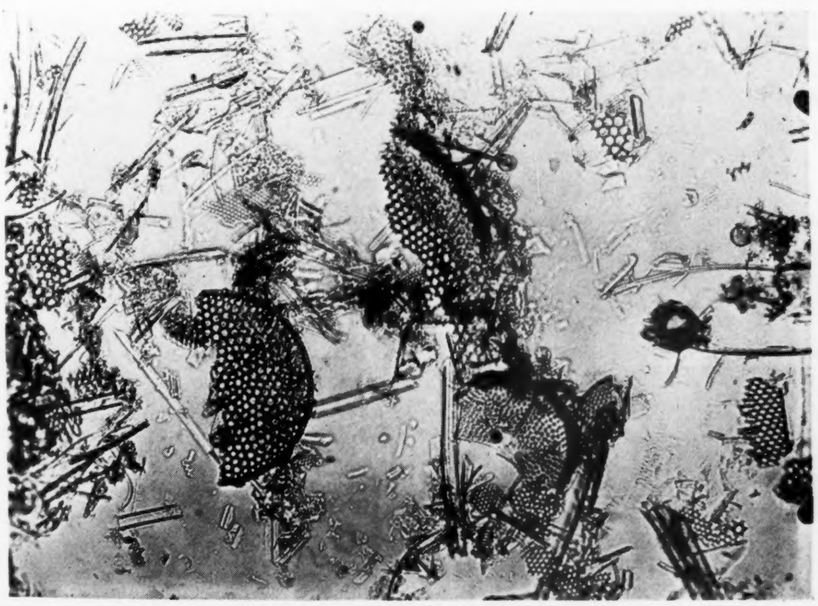


Specimens of diatoms living today, the photograph being taken at a magnification of 150 diameters. These species were taken from water in the Los Angeles river in October, 1928, and many of the types shown are present in the fossil fields of ages ranging from ten to nineteen millions of years, showing no change in structure

Concrete and Cement Admixture

In the field of admixtures to concrete, plasters and stuccos, a very controversial field, the writer simply states his own findings and conclusions, without any desire to affirm or contradict previously expressed statements or opinion of any authority.

The most extensive field at present is that of concrete admixtures, in which field many authorities have contributed much of value regarding the behavior of portland cement in conjunction with such admixtures as pumicite, talc, diatomaceous earth and similar materials.



Specimen of diatomaceous earth from California, taken at a magnification of 300 diameters. The portions of round diatoms shown in the photograph belong to the species Coscinodiscus

With certain reasonable requirements as to chemical composition of the diatomaceous earth material used as an admixture, the important requirements are those of absorbent power and lubricating effect in the concrete mix. Tests have demonstrated that there is a fairly definite relation between the absorbent power of a diatomaceous earth admixture and its lubricating effect, but this relation cannot be stated in definite terms as yet.

The importance of maintaining a predetermined water cement ratio is well known from the exhaustive tests made under the supervision of the Portland Cement Association and published as general information, but, as far as is known to the writer, little account has been taken of the character of the diatom particles in the case of diatomaceous earth admixtures. This factor has a definite bearing on the behavior of diatomaceous earth in the concrete mix.

In the case of several types of diatomaceous earth tested it was possible to predict the behavior of the material in the concrete mix rather closely from consideration of the types of diatoms present in the material. In one case the similarity, amounting almost to identity in size and uniformity, of the diatoms to the portland cement particles made it possible to accurately predict the behavior of the mix, and the 7-day and 28-day compressive strengths, based on the known behavior of standard concrete mixes. In other words, since the factors of fineness and uniformity of cement particle size have been shown to markedly affect the strength of concrete, it might be expected that the same marked effects would follow the use of a material so nearly like portland cement in the particulars mentioned. Such was the case; the concrete showed a considerable increase in compressive strength at the end of the 7- and 28-day periods, with greatly improved workability as compared to the standard portland cement mixes.

As a Pozzolana

Marked pozzolanic effects were noted throughout the tests, and it is difficult to state to just what extent the superior properties of the concretes of these tests were due to pozzolanic action; it is evident, however, that the pozzolanic effect and the exceptional uniformity of particle size are interrelated and interdependent.

From the operator's standpoint the advantages of using diatomaceous earth as a concrete admixture lie in the increased workability and ease of stripping, resulting in marked economies in building operations. Similar improvements follow its use in the lack of segregation of aggregates in the mix while it is being poured or transported to

pouring stations, and the absence of laitance.

The amount of additional water required by the use of diatomaceous earth as an admixture must obviously be kept as low as possible, to not disturb the predetermined water cement ratios and their permissible variations. The writer's experience in this connection has been that the amount of additional water required by the various diatomaceous earth admixtures now on the market varies between rather wide limits, with the admixtures giving relatively better results requiring less additional water to that required by the standard portland cement mix, and the material giving superior results requiring no additional water. The present apathy of operators and engineers toward the use of diatomaceous earth as an admixture is due, in the opinion of the writer, more to having been unfortunate in the selection of diatomaceous earths unsuited for the work than anything else.

Action in Concrete Mix

The action of diatomaceous earth in a concrete mix may be described by stating that, being dry when added with the portland cement, it is thoroughly mixed throughout the entire mass. Upon adding the water the diatomaceous earth, because of its porosity, immediately absorbs the free water up to the limit of its absorptive capacity, leaving the rest of the water to combine with the other ingredients of the mix, thus literally "starving" the mix. However, upon absorbing the water, the diatomaceous earth acts as a lubricant to the mass, causing it to work smoothly and strip easily. Because of its fineness of size and uniform distribution throughout the mass it fills a large percentage of the voids and minimizes segregation of aggregates in the mix.

In holding back the water in the mix, and giving it up only when all free water has combined with the cement, the final set is somewhat retarded in point of time, but the increased uniformity and homogeneity of the mass together with the lessened importance of water curing the concrete when in place more than offset this factor.

Tests made under the supervision of the writer show a considerable increase in 7- and 28-day compressive strengths of concrete containing the uniform type of diatomaceous earth previously mentioned, and a slight increase when using other types of diatomaceous earth, proving the correctness of the reasoning as regards these admixtures.

This also applies to the use of the material in mortars, stuccos and plasters, and care in selecting the proper type of diatomaceous earth will be reflected in the improvement of the behavior of the mixes as well as in savings in dollars and cents.

The various photomicrographs accompanying this were selected at random as showing diatomaceous earths of radically different types. No attempt will be made here to point out the particular species represented, but the photomicrographs will serve to emphasize the points mentioned.

Statistics of Minerals and Earths, Ground or Otherwise Treated

THE DEPARTMENT OF COMMERCE announces that, according to data collected at the biennial census of manufactures taken in 1928, the establishments engaged primarily in grinding or pulverizing certain earths, rocks or minerals, such as emery, flint, ocher, barytes, manganese, chalk, talc, feldspar, sandstone, kaolin, mica, fuller's earth, pumice, slate, etc., reported a total output valued at $41,210,461, a decrease of 2.8% as compared with $42,380,930 for 1925, the last preceding census year.

Of the 245 establishments reporting for 1927, 46 were located in Pennsylvania, 26 in New York, 22 in Ohio, 14 in California, 14 in Illinois, 13 in North Carolina, 12 in New Jersey, 11 in West Virginia, 9 in Georgia, 7 in Massachusetts, 7 in Missouri, 7 in Vermont, 6 in Maryland, 5 each in Connecticut, Texas, Virginia and Wisconsin, 4 in Florida, 4 in New Hampshire, 3 in Maine, and the remaining 20 in 15 other states. In 1925 the industry was represented by 250 establishments, the decrease to 245 being the net result of a loss of 57 and a gain of 52. Of the 57 establishments lost, 19 went out of business prior to 1927, 15 did no manufacturing during the year, 18 reported commodities other than ground or pulverized minerals and earths as their principal products for 1927 and were therefore transferred to the appropriate industries, and 5 reported products valued at less than $5000.

The statistics for 1927 and 1925 are summarized in the accompanying table. Figures for 1927 are preliminary and subject to such correction as may be found necessary after further examination of the returns.

Diatomaceous Silica as Admixture in Concrete

A PREVIOUS ITEM dealing with this investigation appeared in *Technical News Bulletin* (of the Bureau of Standards) No. 141 (January, 1929). Other properties of the diatomaceous silicas are being studied as an aid in the development of specifications. Settling tests have been made on the representative samples according to one particular method of procedure which has been proposed. In this method 2-g. samples of the different materials are placed in graduated cylinders, and sufficient water is added to make a total volume of 100 ml. at 20 to 30 deg. C. The mixture is then shaken thoroughly, after which the cylinders are allowed to stand on a level space for 20 minutes and for 5 hours respectively. The percentage of material in suspension in the 80 ml. nearest the top of the cylinders is then determined. The material in suspension in the top 80 ml. of water varied from 13.2 to 60.4% at the end of 20 minutes and from 2.4 to 25.3% at the end of 5 hours.

It was noted that the diatomaceous silica swells when placed in lime water. A study of the volume of the resulting floc from the various representative samples may be an index of the fineness of subdivision and purity of the diatomaceous silica. It has been found that 2-g. of the various materials from flocs varying from about 12 to 35 ml. when placed in 100 ml. of saturated calcium hydroxide and allowed to settle 24 hours after an initial shaking of about 30 seconds. If the same procedure is followed the measurements of the volume of the resulting floc from each diatomaceous silica may be checked to within 1 or 2 ml.

It has also been observed that diatomaceious silica will remove lime from a calcium hydroxide solution, from 1.15 g. CaO per liter (the approximate concentration of a saturated solution at 30 deg. C.) to about 0.07 g. CaO per liter. Increasing amounts of silica apparently do not further decrease this latter value. A study of the rate of this reaction has shown that different kinds of silicious materials decrease the concentration of the calcium hydroxide at different rates. The rate of the reaction has been measured by both chemical analyses of the resulting solutions and pH determinations with very good agreement. It has been found possible to distinguish the purer grades of diatomaceous silicas (as determined from petrographic examination) from those containing considerable impurities by this method, but to date it has not been found possible to differentiate the purer grades, since the rate of decrease of concentration of the calcium hydroxide is so nearly the same with these latter materials. The time involved in obtaining these rates is too long to be of any value as a method for specifications.—*Technical News Bulletin* of the U. S. Bureau of Standards.

STATISTICS ON MINOR MINERALS AND EARTHS

	1927	1925	Per cent of increase (+) or decrease (—)
Number of establishments	245	250	—2.0
Wage earners (average for the year)*	8,270	8,762	—5.6
Wages†	$ 9,832,692	$ 9,882,383	—0.5
Cost of materials, mill supplies, fuel and purchased power, total†	$17,710,493	$17,164,594	+3.2
Materials and supplies	$14,299,728	(‡)	....
Fuel and power	$ 3,410,765	(‡)	....
Value of products†	$41,210,461	$42,380,930	—2.8
Value added by manufacture§	$23,499,968	$25,216,336	—6.8
Horsepower	116,784	127,649	—8.5

*Not including salaried employees.

†The amount of manufacturers' profits cannot be calculated from the census figures, for the reason that no data are collected in regard to a number of items of expense, such as interest on investment, rent, depreciation, taxes, insurance, and advertising.

‡Not reported separately.

§Value of products less cost of materials, mill supplies, fuel, and purchased power.

Pumping 270 Tons of Sand Per Hour

Koenig Coal and Supply Co. Produces Large Tonnages at Its Oxford, Michigan, Plant

THE KOENIG COAL & SUPPLY CO., one of the largest and most successful producers of commercial sand and gravel aggregates in the country, operates a plant at Oxford, Mich., using hydraulic pump dredge equipment for the excavation of materials. The deposit, an old glacial area with an abundant supply of water, varies in thickness from 10 to 25 ft. above water level and 30 to 45 ft. below water level. The sand particles are of irregular cleavage plane structure making a sharp sand, and the gravel varies in size from commercial sizes which require only grading by screening up to oversize pieces of 4 to 12 in. in diameter which necessarily have to be crushed before screening. All of the materials are of heavy structure, particularly suited for concrete structural work.

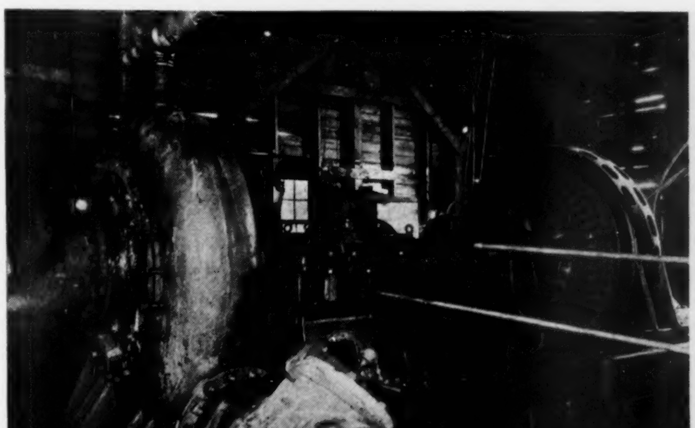
During the first years of operation, a plain suction pipe was used for excavating the materials, but even when using a high water pressure jet head and a stone box inserted in the line on the deck of the boat, this method was not entirely satisfactory. Steady production was not possible, due to the irregularity of the feed of solid material to the pipe as well as the plugs and jams on account of oversize material entering the line.

In the spring of 1928 the American Manganese Steel Co. was selected to rebuild the equipment and, if possible, remove these causes of production delay. The boat and cabin as well as the original motor and its electrical controls were left as constructed. However, it was recognized that an agitator ladder was needed to insure a regular flow of material to the suction pipe line and, also, in order to balance the dredge properly and enable it to support the ladder, forward pontoons were added. These pontoons are of heavy timber construction, attached to the hull proper by means of large stringers.

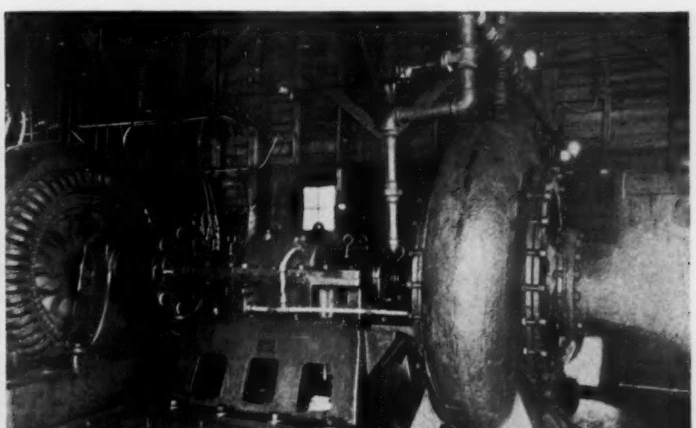
The Koenig company's dredge from the front, showing the agitator ladder and forward pontoons

A special design "A" frame constructed of heavy timbers with joints made with steel gusset plates bolted into place acts both as a yoke tying the pontoons together and as a support for the ladder. For supporting the ladder, a heavy steel yoke attached to the cap block of the "A" frame carries the block rigging leading to the bail of the ladder. A lead sheave block guides the hoist line to a sheave mounted on the frame and then to the hoist. A chain attached between the ladder bail and the lower block of the hoist rigging does away with the possibility of the cable line being cut by the sand and grit when the ladder is in digging position. This entire arrangement affords correct reeving of the hoisting lines without twisting and permits positive hoisting of the ladder without lines' interference

The ladder is designed for a 15-in. pipe with an Eagle "Swintek" cutter, and is 45 ft. long, of heavy bridge-type structural steel construction. The traveling chain, driving sprocket and track liners are made of "Amsco" manganese steel to resist the abrasive action of the materials handled. A 35-hp. motor is used for driving the ladder through a belt to the clutch pulley of the drive gear mechanism. The chain, with openings of 7-in. by 9-in. permitting solids of this size to be pumped into the pipe line, travels approximately 40 ft. per minute. Large, outcurved, digging arm attachments and vertical carrier attachments on the chain give the ladder powerful digging ability and also provide for removing oversize pieces from the nozzle, thus permitting uninterrupted digging regardless of the nature of



The 15-in. pump and its motor on the Koenig dredge boat



Another view of the pumping unit on the dredge boat

the deposit handled. The suction pipe line is a smooth, clean system from the ladder nozzle to the pump, giving maximum freedom to the flow of the material.

The dredge pump is a 15-in. "Amsco" type "H" heavy duty pump with full, marine-type thrust bearings, water cooled. The water end parts are all made from "Amsco" manganese steel, carefully ground to assure accurate fit when replacements are necessary. The shell is of the efficient snail type, the side plates provided with renewable liners and the stuffing box provided with a water seal chamber. Priming is cared for by a water type ejector and high pressure water system. The pump is directly connected through a full flexible coupling to a 500-hp. Allis Chalmers, 3-phase, 60-cycle, 4600-volt, slip-ring motor with the speed variation controlled by a continuous duty resistor and drum controller. The entire unit mounted on heavy oak timbers is heavy and of very smooth operation.

The pipe discharges the material 1400 ft. from the dredge at the plant proper, with a 22-ft. lift above water level at the discharge point. The pipe line is mounted on pontoons from the dredge to the plant. Power for the dredge is supplied by a 3-wire system from a sub-station on the shore, with the poles mounted on the discharge line pontoons.

The new equipment established a fine record during 1928, as maximum steady production with negligible shut-down delay was secured. Increased production for a given period was established as well as splendid wearing service from the new equipment. Eleven thousand seven hundred and eighty-three cars averaging 54 tons each were shipped during the season of 198 working days. In addition, a large amount of the sand handled by the pump was wasted. It has been conservatively estimated that over 3,000 cars of sand were wasted and that the total production handled by the dredge equipment was 15,000 cars of material, or an average of 75 cars per day. The actual time records, 15 hours digging time per day, show an average of about 270 tons excavated per hour and delivered to the plant for screening and sizing

The Koenig dredge boat with the agitator ladder raised. The construction of the "A" frame on the forward pontoons is well shown

To Study Curing of Concrete Pavements

THE EXECUTIVE COMMITTEE of the Highway Research Board, National Research Council, announces the formation of a special committee to conduct an investigation of the problem of proper curing methods for concrete pavements. The work will consist largely in correlation of the research work being carried on by the Bureau of Public Roads and various state highway departments. Committee: Chairman, F. C. Lang, University of Minnesota and Minnesota state highway department; E. F. Kelley, chief of the division of tests, U. S. Bureau of Public Roads, Washington, D. C.; W. A. Slater, research professor of engineering materials and director, Fritz engineering laboratory, Lehigh University, Bethlehem, Penn.; F. V. Reagel, engineer of materials and tests, Missouri state highway department, Jefferson City, Mo.; Frederick E. Schnepfe, civil engineer, Washington, D. C.; H. F. Gonnerman, manager, research laboratory, Portland Cement Association, Chicago, Ill.; Stanton Walker, director of engineering and research division, National Sand and Gravel Association, Washington, D. C.

Chicago Banker a Director of Texas Gravel Company

MELVIN A. TRAYLOR, president of the First National Bank, of Chicago, is chairman of the board of directors of the Panhandle Sand and Gravel Co., Lubbock, Texas, which has been incorporated with a capital stock of $300,000 and has already started the work of developing an enormous deposit of sand and gravel along the banks of the Quitaque river, adjacent to the new line of the Denver and South Plains railroad. The headquarters of the company are at Lubbock. A. N. Brown, former president of the First National Bank, of Lockney, Texas, is president of the Panhandle Sand and Gravel Co. The company has installed a large amount of equipment and is capable of producing 100 cars of material a day, it was stated. The discovery of this sand and gravel deposit was made when the grade for the tunnel for the new railroad was excavated so that the rails could reach the altitudinous "cap-rock" or plains. The importance of the discovery lies in the fact, it is claimed, that this is the only known large deposit of building and road materials in northwest Texas. It underlies approximately 2000 acres and it is estimated that it will yield more than 25,000,000 cu. yd. of material.

Material Service Corp. Launches New Style of Sand Boat

A NEW type of boat, particularly designed to carry a cargo of 2500 tons and yet be able to pass under river bridges was launched at Sturgeon Bay, Wis., on March 6. The new boat was designed by Leathem D. Smith and is owned by the Material Service Corp. of Chicago, who expect to use it in bringing sand from Lake Michigan to the company's property located on the Chicago river and also from the new plant on the Sanitary canal near Chicago. It is hoped that this new boat will revolutionize river traffic about Chicago, and will eventually do away with the opening of bridges in the heavy traffic sections of the city where bridge openings have caused many delays in street traffic.

The new boat, which is known as the *Material Service*, cost $250,000. It is 240 ft. long and built low to pass under the fixed bridges. The boat will be powered with twin Diesel engines. It is of steel construction and is self-unloading. It is also equipped with its own sand pumping equipment for dredging in the lake. Irving Crown, of the Material Service Corp., is quoted as saying that material can be brought to the Chicago yards with the new boat for about one-third of the cost with previous methods.—*Chicago Tribune*.

French Refractory Hydraulic Cement

High-Alumina Cement-Bauxite Mixture with Which Concrete Having Fairly Good Refractory Properties May Be Made

By J. Arnould

Translated for Rock Products from the French "Chemie et Industrie"

THERE has always been more or less difficulty in constructing the masonry parts of fire boxes so as to render them sufficiently resistant to the high temperatures to which they are subjected. As is known, all sorts of shapes of brick are used in building the various arches and the like and these bricks are cemented together to form a solid structure. It has been hoped that some material could be obtained which would do away with this and which could be applied in a single coat or mass to form these structures, one which would harden in place and which would not contract or expand when subjected to the high temperatures of the furnace. In other words, what has been looked for was a refractory cement. A certain amount of work to perfect such a cement has been done in France and the results obtained have been successful to a certain degree. The work which is described in the following article was undertaken for the purpose of establishing the properties of this refractory cement and improving its quality.

The product that is looked for must have a number of properties. In the first place the cement must be able to set in the cold without contracting. Then it must become solid without changing shape, and finally it must keep its tenacity when subjected to high temperatures. Moreover, after burning it must not be subject to cracking, splitting, contraction nor dangerous expansion. In fine it was necessary to obtain a product that was plastic in the cold, capable of being burned in the place where it was applied and which would retain in the burned condition a large portion of the strength that it possessed in the cold state. Then again the product must be highly refractory; that is, it must be able to withstand without melting a temperature in excess of 1580 deg. C.

General Plan of the Investigation

The author determined to examine and limit himself to the testing of true cements; that is, the hydraulic products which set when mixed with water. There are three classes of cements which are on the market today and which have low enough prices to recommend them for this purpose. These are portland cements, magnesia cements and aluminous cements.

The problem involved finding some substance, which when added to one of these cements, would give rise to the formation of a substance, either during the period of setting or during the heating period, possessed of a high fusion temperature, while still conserving all of the hydraulic properties of the orignal cement.

Portland cements, when heated to a temperature in excess of 500 deg. C. disintegrate and fall into a powder, after having given up their lime content in the successive hydrations and dehydrations. The experiments which were made with these cements were abandoned one after the other, no satisfactory results being obtained in any case. Thus it was found that setting was difficult; that it was impossible; that it was too rapid; the product was found to be fragile after heating, it cracked, swelled up, contracted too much in the cold and at high temperatures. It was also found that in certain cases the fusion temperatures were too low, and in addition there were other reasons why success was not obtained.

Experiments With Magnesia and Aluminous Cements

Magnesia cements set well in the cold and have a strong tenacity. When refractory materials, such as bauxite, were incorporated with them, a good mortar was obtained, but these mortars did not absorb carbon dioxide from the air and could not stand up against temperatures greater than 800 deg. C. At these temperatures they were rendered completely friable. No experiment gave results which allowed the magnesia refractory cements to withstand higher temperatures.

The next class of cements that were experimented with were the aluminous cements, also commonly known as fused cements or *ciments fondus*. As is well known, these cements contain high proportions of alumina and are composed in general of 10% SiO_2, 40% of Al_2O_3, 40% of CaO and 10% of Fe_2O_3. During the course of the setting of these cements, alumina is set free in an extremely fine state of subdivision. It would therefore seem possible that a reaction could be induced to take place between the alumina and some other substance to form a refractory compound.

The first mixture that was tried contained aluminous cement, magnesia and silicate of soda. A great many tests were carried out on this mixture and the first really successful results were obtained. Unfortunately, however, although the cement was of good quality and could withstand high temperatures, nevertheless it set too rapidly. Under certain special conditions it could be used with safety, but the author has not thought it worth while to describe them in this article.

Aluminous Cement and Bauxite

In making these investigations, the author came across a book written by Sainte-Claire-Deville in 1856, on high temperatures, wherein the author gives a formula for the making of laboratory crucibles. He heated a mixture of pure alumina and marble to a very high temperature and this gave him, of course, a sort of cement. He mixed this cement with two parts by weight of alumina (well calcined) and from this mixture he was able to make articles which stood up very well against the action of high temperatures. The aluminous cements were discovered in 1908 and a profound study was made of the aluminates which Sainte-Claire-Deville had just touched upon. By using the formula which was developed so many years ago by Sainte-Claire-Deville, the author was able finally to make a hydraulic cement which, while it cannot be considered as absolutely refractory, in the strictest sense of the word, nevertheless will withstand high temperatures without deterioration. This cement is a mixture of aluminous cement and bauxite made under certain conditions.

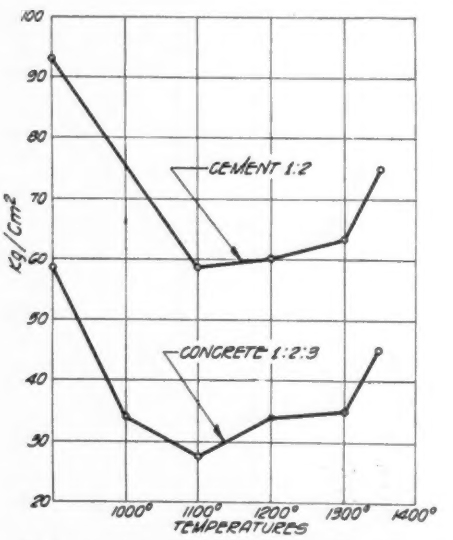
The aluminous cement employed is the regular commercial variety, such as is made today by a number of cement mills. It makes no difference how the cement was manufactured, whether in the electric furnace, or in the water-jacketed furnace. Good results are obtained in both cases, although the *ciments fondus* made in the electric furnace have been found to give mixtures which are slightly more refractory than the others.

The bauxite used must be sufficiently refractory in itself, and as may be expected, the percentage of iron that it contains is an important consideration. The bauxites which the authors employed in making these experiments had the following average composition: 70% of alumina, 15% of silica and 10% of iron. A bauxite which has as much as 12% of iron may be tolerated, the iron being figured as iron oxide, but when the percentage of iron reaches as high as 20%, then the bauxite cannot be employed. On the other hand, there is no object in

trying to find bauxites which contain less than 9% or 10% of iron oxide. The proportion of alumina in the bauxite should always be greater than 40%.

Manufacture

The bauxite must first be calcined at a temperature which is above the temperature of the transformation of alumina, that is above 1070 deg. C. The calcining process is carried out in vertical kilns of the lime kiln type. At a temperature of 500 deg. C. an endothermic reaction first takes place, which



Average compressive strengths of refractory cement and concrete after heating to various temperatures

results in the removal of the water. Then from the temperatures 1000 to 1070 deg. C. the reaction is exothermic and irreversible. The alumina is really polymerized.

The calcined bauxite is ground and screened wherever this is necessary before being mixed with the aluminous cement. The granular condition of the bauxite plays an important role in the future resistance of the cement to the action of high temperatures, as well as in the setting of the cement.

The size of the granules of the bauxite may be varied in accordance with the uses to which the finished material is going to be put. It is in fact possible to attain a fineness which is comparable with that of cement itself by properly carrying out the grinding process. The mixture of *ciment fondu* and the bauxite should be made as perfect as possible, so that one grain or particle of the cement is followed by one of the bauxite. This entails considerable care in the operation of the mixing apparatus.

Properties and Characteristics of the Refractory Mixture

This mixture has given very interesting and important results. In the first place it is really a good grade of hydraulic cement, which when admixed with 22% to 30% of water can be made to flow in suitable conduits, can be molded into various shapes, will set well and afterwards harden.

It is a cement which sets slowly and hardens rapidly, and this permits the worker to mold it into shape without having to hurry along the operation. The setting of the cement begins at the end of an hour and a half and is finished at the end of four to six hours. The hardening of the cement proceeds very rapidly and at the end of a 24-hour period it is possible under certain conditions to remove the mold facings.

The resistance of the cement to compression is 145 kilos per sq. cm. at the end of three days (2000 lb. per sq. in.). Its resistance to tension at the end of the same period of time is 21 kilos per sq. cm. (about 300 lb. per sq. in.).

Furthermore, it is possible to make a concrete, which is really a true concrete, with the aid of this cement, and the aggregate used is crushed refractory fragments.

In making a concrete with this cement it is advisable to employ old refractory bricks, which, having been heated time and again, have lost all shrinkage as aggregrate. The refractory fragments are crushed in such a manner that the largest of the lumps do not exceed the size of a hazel nut or almond (about ¾-in. dia.).

Care must always be taken to remove the dust after crushing, for this dust has the effect of preventing the setting of the cement under some conditions. The dust is removed by screening or better by washing with a copious flow of water.

When the product is washed, the additional advantage is secured in that the crushed masses thoroughly soak up the water and avoid the necessity of adding water for making up the cement mixture.

The refractory fragments are then mixed with the cement in the proportion of one to two or three parts of the fragments to three parts of the cement, according to the use to which the concrete is going to be put. The reason for the variation in these proportions will be explained below. The concrete is handled and used in the same manner as ordinary portland cement concrete. The material is tamped in the molds in order to render the mass as compact as possible.

Behavior of Concrete When Subjected to Fire

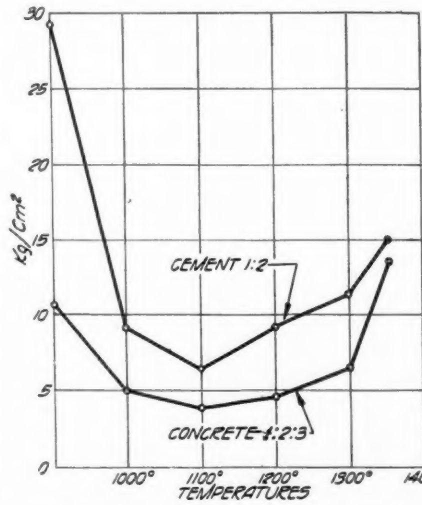
The next interesting point is the manner in which the refractory cement or concrete behaves when subjected to the high temperatures that prevail in furnaces. The cement, by which is meant the mixture of aluminous cement and bauxite, is first allowed to set and harden. This hardened mass may be heated to a temperature of approximately 1600 deg. C. before it will melt. Unfortunately it begins to soften around a temperature of 1350 to 1400 deg. C. The same is true of concrete made from this cement.

Interesting tests were made on the resistance of the product to compression while in the heated condition. The apparatus used for this purpose is similar to the one that has been described in Transactions of the Ceramic Society 1917, 16, volume XVII, Part II.

The cement under these conditions had a resistance to compression of 20 kg. per sq. cm. (280 lb. per sq. in.) up to temperatures of 1200 to 1250 deg. C. Then when heated to higher temperature its resistance to compression suddenly dropped and became 2 kg. per sq. cm. (28 lb. per sq. in.) at a temperature of 1300 to 1350 deg. C. and finally it became soft but never so soft as to flow. The curve of the resistance of cement to compression under heat may be said to come between that of bauxite and carborundum.

But it must be said that these cements and concretes possess a very remarkable property in the fact that they shrink or contract so slightly. At a temperature of 1350 deg. C. this amounts to from 1% to 1½%. Under certain conditions, that is when the blocks of concrete are compressed in a press, the contraction is only 0.5%.

There is another remarkable property possessed by these cements and concretes which makes them very valuable as refractory materials. That is that they do not change very much when subjected to sudden changes in temperature. As all know, this is a property which is very desirable indeed in re-



Average tensile strengths of refractory cement and concrete after heating to various temperatures

fractories. Samples of the concrete and cement 6 cm. high, 6 cm. wide and 2 cm. thick, when subjected to the temperature change that is induced by taking the hot mass from a furnace at a temperature of 1380 deg. C. and allowing it to come into a room at a temperature of 20 deg. C., do not break or crack. Samples of concrete which are treated in this manner do not crack nor do they fall into powder when subjected to repeated heating and cooling in this manner.

Temporary Friability

I examined the new products to determine their resistance to compression and tension in the cold after being subjected to different temperatures. We found that there was a certain friability in these products after they had been heated to a temperature of 1000 deg. C. This friability, which is probably due to the removal of the water

of crystallization which is contained in the cement, begins to appear at a temperature of 800 deg. C. and attains its maximum at a temperature between 1000 and 1200 deg. C. and then it disappears altogether at a temperature of 1300 deg. C.

Color an Indicator of Friability

The friability is generally accompanied by a change in color and furthermore it is greater the less oxidizing the atmosphere in which the product is heated. In a reducing temperature the color of the cement becomes a clear yellow, while in an oxidizing atmosphere the cement becomes a yellowish brown.

The cement, or more properly the mixture of aluminous cement and bauxite, is less friable, the lower the proportion of bauxite it contains. The mixture of one part of cement and two parts of bauxite never becomes so friable that it cannot be used.

Furthermore, the more crushed refractory fragments that the concrete contains the more friable it is. Hence it is possible to avoid the friability by reducing the proportion of the refractory fragments used as aggregate. Furthermore, it is possible to make the friability of the product disappear altogether by heating the molded article or the piece of concrete for just one time above a temperature of 1250 deg. C.

The curves which have been plotted for different mixtures show that the friability of these products is never dangerous in the case of a concrete which is composed of one part of aluminous cement, two parts of bauxite and three parts of refractory fragments. The addition of the refractory mass is important from a number of standpoints. It reduces the contraction of the mass, enhances the strength of the concrete, prevents the spalling of the concrete and the formation of fissures and finally renders the concrete a more economical product.

On the other hand it must be remembered that when the proportion of refractory fragments is increased, the friability of the concrete is increased. We have thus a condition which requires the exercise of good judgment in order to obtain a product with the best properties. The mixture, which has been indicated above, seems to be the one that gives the best results in the majority of cases. It is possible to increase the proportion of the refractory fragments for work which will be carried up to a temperature in excess of 1250 to 1300 deg. C. only once and then used at lower temperatures.

Studies to Improve Refractory Cement

Combinations of silica, alumina, lime and iron are usually found in cements. The formulas of the various combinations that can take place among these ingredients have been subjected to considerable investigation and study. However, there remain to be examined the combinations: iron-silica, iron-lime and iron-lime-silica. When this information is available it may be possible to find mixtures of alumina, iron, silica and lime which will give the best results under all working conditions.

We ourselves have been able to develop the following information: The oxide of glucinum gives better results than alumina, which explains the place that has been assigned to this metal in chemical classifications. On the other hand this fact has no practical interest. It has also been found that the presence of titanium dioxide to the extent of 3% in the cement is not a detriment.

The attempts that have been made to raise the softening point of the new cement have not been favored with much success. The aluminous cements which are obtained by heating to sintering and not by fusion, when used in this cement, permit the softening point to be raised by about 50 deg. C.

Effects of Incorporating Flint and Silicate of Soda with Cement

On the other hand it has been found that it is possible to diminish, and indeed to make the friability disappear entirely by incorporating a little pulverized flint with the refractory cement described or even some pulverized sodium silicate. The silicate must be slightly alkaline and non-hygroscopic. It can then be mixed with the cement and the mixture can be stored without there being any danger of the cement partially setting on exposure to the air.

While these two substances, flint and silicate of soda in the pulverized condition, have the property of reducing the friability of the cement, nevertheless they unfortunately possess the disadvantage of reducing the fusion point of the cement, and the softening temperature as well. But it has been found in actual practice that very good results are obtained with the aid of pulverized flint of high purity.

Finally it has also been found that dehydrated clay (heated to a temperature of 800 deg. C.), which possesses hydraulic properties, when added to the mixture of aluminous cement and bauxite, seems to reduce the friability to a certain degree. But the effect obtained does not appear to be important enough to compensate for the trouble of making of this product.

Uses of the Cement

The properties of the cement and the concrete have been described and no effort has been made to hide their faults. But it is needless to say that these products can be used to good advantage in industries for many different purposes. It must be remembered that the basis of the refractory cement is a hydraulic cement, and hence the mixture can be poured in forms just like ordinary cement. Furthermore, it can be molded by hand or under pressure into objects which are designed to support internal temperatures lower than 1400 deg. C. The use of these cements removes the necessity of the preliminary heating operation which is necessary in the case of certain refractory materials which makes them so costly. The pieces of concrete are baked right in their places in the construction of the furnace.

When these cements are employed in the form of concretes, there are many uses which can be found for them. Thus, for example, they may be employed in the construction of furnaces and in the fabrication of specially designed pieces of intricate profile, which are so difficult to secure under ordinary conditions. The cements may thus be employed in the building of chimneys, of baffles, of combustion chambers in producers, for lining the tubes in boilers, for the flues in recuperative furnaces. In this case the parts are molded under pressure. The cements may also be employed in molding all sorts of parts, such as hearths of all dimensions and sizes, which are furnished with external supports of various kinds. Also there may be mentioned vaulted arch work.

When the cement is employed alone, it can be used to great advantage for repairing broken parts of all sorts, for closing up holes, cracks and fissures. It can be used as a coating over old constructions of different kinds which it is desirable to protect against the action of high temperatures and flames.

Finally the cements can be admixed with asbestos and then manufactured into boards which are light in weight and which can withstand the high temperatures.

Various factories have already used this material to good advantage, it being shipped to them ready-mixed in sacks. This has enabled them to avoid the long delays that occur in the shipment of fabricated parts and the risks of breakage of refractory work of special design. The manufacture of this cement is now being carried out in France.

Poured Gypsum Construction

THE Standard Gypsum Co., Seattle, Wash., has furnished the following information on a new apartment building now under construction which is interesting because of the extended use of gypsum by the builders. They say:

The four story Alamo Apartment Building in Bellingham, Wash., now under construction is a gypsum building: roof, floors and partitions being all of structural gypsum poured in place. The structural steel frame is less than one-third the weight of that used in a similar building of steel and concrete construction. The stairs are of reinforced gypsum.

The outside wall is of 6 in. of concrete backed by 2 in. of poured gypsum; it is perhaps the nearest to being absolutely fireproof of any building on the Pacific Coast, and because of the acoustic quality of poured gypsum it is without doubt the most sound proof; and because of its non-conductivity it will be cool in summer, and most economically heated in winter.

Architects and structural engineers will be interested in this light structural steel and poured gypsum construction.

A Theory Regarding the Plasticity of Lime*

By Kenneth W. Ray† and Frank C. Mathers‡

Synopsis

MANY of the properties of hydrated lime can be explained by the assumption that lime putty is a non-reversible colloid or jelly-like material that, after drying, will not return to its original condition when soaked in water. It is thought that the differences between a putty made directly from a quicklime and one made by soaking a dry hydrate may be due to the difference between their colloidal content. In this article it is shown that most putties contain particles having positive electrical charges and therefore those particles are attracted by any outside negative electrical charge. The amount of this attraction or cataphoresis is greatest for plastic putties and least for non-plastic putties. The theory is developed that plastic hydrates owe their plastic properties to their power of forming charged particles upon soaking or slaking. It is shown from the theory of Donnan that the charged particles hold around them a film of solution, which so lubricates the particles as to make the putty plastic or easy to spread with a trowel. —The Authors.

WHEN A QUICKLIME IS SLAKED directly to a wet putty, many of its properties are quite different from those of a putty made from the same lime by soaking the dry hydrate. The properties of a putty made from a dry hydrate sometimes change as the time of soaking the hydrate increases. Other differences in the methods of preparation of a lime putty produce differences in the properties of the putty. The causes of these differences have never been satisfactorily explained. Any rational theory must account for several known facts. Many theories have been put forth, but only the colloidal or jelly theory will be discussed here.

Theory for Difference in Lime Putties

According to this theory, lime forms an irreversible colloid, or at least some irreversible colloidal material, during its slaking. If, in the slaking process, only sufficient water is used to produce a dry hydrate, the colloids are destroyed during the drying out of the hydrate and, upon subsequent treatment with water, will not again assume the colloidal state. But if sufficient water is used to leave the slaked lime as a wet putty, the colloidal properties are retained. The colloidal material present modifies the properties of the lime putty, and causes the differences observed between the putties made directly from the quicklime and those made by soaking the dry hydrate. It is thought that plasticity, as well as some other properties of lime, depends upon the presence or absence of colloids.

This theory explains several of the known facts concerning the behavior of lime and lime putties. Most high-calcium quicklimes, when slaked directly with excess water, give a putty that is plastic and has a low rate of settling from water suspension; but if the quicklime is hydrated to a dry hydrate which is then soaked in water, a more non-plastic and a more rapidly settling putty is obtained.[1]

According to this theory, it is the colloidal nature of the putty made by the direct slaking of the quicklime that makes it more plastic and slower to settle than the non-colloidal putty made by soaking the dry hydrate.

It is also known that the dry hydrates from certain dolomitic quicklimes form plastic putties upon soaking, while those from other dolomitic quicklimes do not. Briscoe and Mathers[2] and Fox and Mathers[3] have shown that this is because the magnesia of the quicklimes which give the plastic hydrates is not completely hydrated during the hydration and that the non-hydrated magnesia slakes during the soaking. This would form the colloids necessary for plasticity. These authors have also shown that the magnesia of the quicklimes giving the non-plastic hydrates either completely hydrates during the hydration or else does not hydrate during the soaking. In this case no colloids would be present in the putty to make it plastic. Emley[4] states that plastic limes can be mixed with more water before they become sloppy or semi-liquid than the non-plastic hydrates. This is another indication of the presence of the colloids in plastic putties, and of their absence in non-plastic ones. The colloidal jelly-like structure of the plastic putty would require more water to produce fluidity than would be required in the non-colloidal, non-plastic putty.

Certain salts and chemicals, when present in the water used in the slaking of a quicklime, affect the properties of the putty formed.[5] This again indicates electrically charged or colloidal particles, and much of the action of the salts upon the lime putty can be predicated by assuming that the lime putty is colloidal or jelly-like in structure.

According to this theory, those putties should be most plastic which are formed directly from a quicklime, those putties should be less plastic that are formed from a dry, partly hydrated lime and those putties should be least plastic that are formed from a dry, completely hydrated lime.

These conclusions were tested experimentally on a small scale in the laboratory by using four ¼-lb. samples of 40-mesh quicklime and treating them with different amounts of water. Each sample was then made into a putty and after soaking 12 hours, its plasticity was measured on the Emley plasticimeter. Sample *A* was slaked direct to a wet putty and sample *D* was hydrated to a dry hydrate. Samples *B* and *C* were partially hydrated. The amount of combined water in the partly hydrated products were determined, and then they were made into putties with excess water in which the remainder of the lime slaked. The results were as follows:

Sample	Amount of water in hydrated powder	Plasticity
A	Wet putty	240
B	7.5%	190
C	15.0%	180
D	25.0% (dry hydrate)	130

In these tests special care was taken to prevent the partly-hydrated limes from burning during the treatment with the small amount of water, but even under these conditions the temperature of sample *C* reached 350 deg. F.

Thus we see that the facts are in harmony with the above conclusions, and that the colloidal theory seems to explain some of the facts of the behavior of lime very well. However, the actual presence of colloids in a plastic lime putty has never been definitely proved, nor has the absence of colloidal particles in putties made from completely hydrated dry hydrates been proved. The

*Rewritten and changed by the authors from an article "The Colloidal Behavior of Lime," in *Ind. and Eng. Chem.*, May, 1928. The article is a portion of the thesis for the degree of doctor of philosophy by Kenneth W. Ray at Indiana University, 1926.

†Professor of chemistry, Linfield College, McMinnville, Ore.

‡Professor of chemistry, Indiana State University, Bloomington, Ind.

[1] Holmes, Fink and Mathers, *Chem. and Met. Engr.*, 27, 1212 (1922).

[2] *Ind. Eng. Chem.*, **19**, 88 (1927).
[3] Fox and Mathers, unpublished work.
[4] Bur. Standards, Tech. Paper **169**.
[5] Kohlschütter and Walther, *Z. Electrochem*, **25**, 159 (1919).

effects of salts on certain lime putties have been attributed to charged particles, but no proofs were given. On this account, experiments were undertaken to prove the presence of colloidal or charged particles in lime putties and to show that the putties from plastic or finishing hydrated limes contain more colloids than the so-called "Mason's" or non-plastic hydrated limes. Since colloidal particles always carry an electric charge, the magnitude of these charges on the lime putties were determined rather than the amount of true colloids present.

The first experiments were made to determine if the plastic and slowly settling putty made by slaking a sample of an active quicklime with excess water showed any indication of having an electric charge on any of the particles by observing whether or not such a putty was attracted or repelled by electrically charged electrodes.

The particles of lime in a milk-of-lime suspension, if charged, should show an accelerated or retarded rate of settling under an electrical influence. A glass U-tube 1/6-in. internal diameter and 6¼-in. high was filled with a lime putty suspension. After the suspension had settled about ¾-in. in each arm, platinum wire electrodes were inserted into the top of each arm and the 110-v. direct current turned on. Almost immediately the putty in the arm containing the positive electrode began settling much more rapidly than in the arm containing the negative electrode. The current was reversed and the rate of settling in the two arms was also reversed. This repulsion by the positive electrode and attraction by the negative electrode showed that the particles of the putty carried a positive charge.

The arms of the U-tube were calibrated into units of 0.07 in. and a set of experiments was carried out to determine the quantitative effect of the electric potential upon the rate of settling of various lime putties. The comparative effect of the electric charge and gravity on the rates of settling was calculated from the difference in the rate of settling of the two arms. The method of calculation used is shown in the calculation of the results of the first lime putty used. A high calcium commercial quicklime, ¼ oz., was added to about 4 oz. of water and the mixture was stirred during the slaking. The U-tube was filled with this suspension.

TABLE OF SETTLING

Right arm	Left arm	Time, minutes
Units settled		
1.5	1.5	5
3.0	3.0	10
5.0	5.0	15
6.5	6.5	20
8.0	8.0	25
10.0	10.0	32
Electric current started		
Positive	Negative	
10.0	10.0	32
12.5	11.2	37
15.0	12.4	42
17.5	13.6	47
20.0	14.8	52

TABLE OF SETTLING
(Continued)

Current reversed		
Negative	Positive	
20.0	14.8	52
20.4	15.3	57
20.8	16.3	62
21.0	17.4	67
21.2	18.5	72

Calculation of Results

The results are calculated to only two places since the experimental error makes other figures meaningless.

Rate of settling before electrodes were placed in:

Right—10 units in 32 minutes or 0.31 unit per minute.

Left—10 units in 32 minutes or 0.31 unit per minute.

Rate of settling after electrodes were put in:

Right—positive=10 units in 20 minutes or 0.50 unit per minute.

Left—negative=4.8 units in 20 minutes or 0.24 unit per minute.

Average, 0.37 unit per minute.

Gravity alone caused the suspensions to settle 0.37 unit per minute. With the electric potential acting, the left arm settled only $\frac{24}{37}$ as fast as it would have done if there were no electric force acting; therefore, the effect of the electric force was $\frac{13}{37}$ as great as gravity, or 35% of gravity. The putty in the right arm settled $\frac{50}{37}$ as fast as it would have done if there were no electric force acting; therefore, the electric force was $\frac{13}{37}$ as great as gravity, or 35% of gravity.

Rate of settling after reversal of current: The above methods of calculation were used. The results are:

Average rate of settling = 0.12 unit per minute.

Rate of settling of negative arm = 0.06 unit per minute.

Rate of settling of positive arm = 0.18 unit per minute.

Effect of electric charge = 50% as great as gravity.

Using the same experimental methods and the same methods of calculation, the effects of the charge on the rates of settling of the putties from several hydrates and quicklimes were determined. The results are given in Table I.

TABLE I.—EFFECT OF ELECTRIC CHARGE UPON RATE OF SETTLING OF LIME SUSPENSIONS

Preparation of sample	Normal rate of settling (1)	Rate of settling under influence of electric potential Positive (2)	Negative (3)	Effect of electric potential calculated in per cent gravity (4)	Rate of settling with electrodes reversed Negative (5)	Positive (6)	Effect of electric potential calculated in per cent gravity (7)	Average columns (4) and (7) (8)
High-grade commercial high-calcium quicklime ¼ oz. slaked in 4 oz. water; plasticity about 250	0.31	0.50	0.24	35	0.06	0.18	50	42.5
Ohio plastic dolomite ¼ oz. quicklime slaked in 4 oz. water; plasticity 230	0.30	0.42	0.26	23	0.15	0.25	25	24
Non-plastic high calcium hydrate ⅓ oz. in 4 oz. water	2.20	2.2	2.1	2.3	1.8	2.0	5.5	3.9
Same as above, heated to boiling, cooled and tested	2.30	2.3	2.3	0.0	2.0	2.1	2.5	1.2
Same as above, except soaked 24 hours instead of boiling	2.00	2.05	2.0	1.2	2.08	2.06	—0.5	0.4
Ohio plastic dolomite ⅓ oz. hydrate in 4 oz. water; tested immediately	2.5	2.5	2.4	2.0	2.3	2.4	2.1	2.0
Same heated to boiling before testing	2.0	2.0	1.6	12.4	1.3	1.6	11.5	11.9
Same, soaked 24 hours before testing; plasticity about 200	1.8	2.0	1.6	12.4	1.2	1.5	11.1	11.8
Non-plastic dolomitic hydrate, Wis. ⅓ oz. in 4 oz. water tested immediately	2.4	2.1	2.0	2.5	1.76	1.85	2.2	2.4
Same, heated to boiling	2.8	2.8	2.8	0.0	2.5	2.6	2.0	1.0
Same, let soak 24 hours before testing	2.5	2.5	2.3	4.3	2.2	2.4	4.5	4.4

The data of Table I show clearly a relationship between the colloidal content of a putty, as judged by its attraction to an oppositely charged electrode and its plasticity, and also between the rate of settling and the colloidal content of a putty. The results of the tests on the plastic and non-plastic dolomitic hydrates show the difference between a plastic and a non-plastic hydrate. Both hydrates show very little attraction when first made into putties, but the plastic hydrate soon develops the condition necessary for this attraction by the electrode, while the non-plastic hydrate never does. This is thought to be due to the fact that the plastic hydrate contains some unhydrated magnesia which slakes during the soaking,[2, 3] while no magnesia slakes during the soaking of the non-plastic hydrate. The colloids formed during this retarded hydration make the putty plastic and cause it to show the attraction by the electrode of opposite charge. Two additional facts have been observed in this work that support this view: (1) A slight rise in temperature during the soaking of a plastic hydrate but not during the soaking of most non-plastic hydrates; (2) the rate of settling decreases during the soaking of a plastic hydrate, while little or no decrease occurs in the rate of settling of a non-plastic hydrate.

There are several theories[6] to account for the electric charges on the colloidal particles, but perhaps the best is that of Freundlich[7]

[6] Discussed by Briggs, Brit. Assn. Advancement Sci. Rept., 1918. Streekler and Mathews, *J. Am. Chem. Soc.*, **44**, 647 (1922).

[7] "Kapillarchemie," p. 245, Akad. Verlag. m. b. H., 1909.

and of Bancroft,[8] who believe that the charges are obtained by the selective adsorption of cations or anions by the particles of the colloid.

Even though the results of these tests indicate that plastic putties contain a relatively large amount of colloids, and that these colloidal particles are charged, one question still remains to be answered. In what way do colloids cause a lime putty to be plastic?

Briscoe and Mathers[2] have discussed the qualities of a hydrated lime necessary to give plasticity and have defined the property of plasticity of a finishing hydrate. A finishing hydrate, after soaking for several hours, gives a putty that does not dry out rapidly when applied to a dry and absorbent surface. Such a putty works freely and easily under the trowel and spreads without sticking or pulling. It has also been shown that plastic hydrates are incompletely hydrated and that they continue to hydrate during the period of soaking.[3] It has been shown in this paper that charged particles are formed during this final slaking, and that the plasticity of the putty is closely related to the amount of these charged particles formed. It still remains, however, to show how the presence of colloids gives the putty the property of not drying out rapidly when applied to a dry and absorbent surface and of working freely and easily under the trowel.

This is explained by a modification of the Donnan's membrane equilibrium theory.[9] Briefly stated, this theory holds that a charged particle will hold a film of solution around it that is more concentrated with salts than is the solution that is farther away. Furthermore, due to the tendency of water to diffuse into a concentrated solution from a more dilute one, these charged particles will hold the film of water surrounding them more firmly than they would if they were not charged. This prevents the rapid drying out of the putty when it is applied to a dry and absorbent surface. These films of water also lubricate the particles and make the putty easy to spread and work under the trowel. In the same way, the film of water, together with the electric charge upon the particles which makes the particles repel each other, will prevent the agglomeration of the particles. The particles will also be held farther apart, will settle more slowly and will occupy more volume after they have settled.

The one great difference between the colloidal system present in a lime putty and most other colloidal systems is that the concentration of the solution outside the film immediately surrounding the particle cannot be greatly decreased. The magnitude of the force holding the film around the particles could be increased by a decrease in the concentration of the dispersing medium, but since a saturated solution of calcium hydroxide is always present or is soon formed in the solution, this change is impossible without changing the liquid present.

Conclusions

1. Plastic lime putties contain particles that carry a positive electric charge.
2. The magnitude of the charge on the particles varies with different lime putties, and seems to be somewhat related to the plasticity of the lime putty.
3. Hydrated limes usually do not give plastic putties immediately after addition of water. Moreover, no such putties freshly made from dry hydrated lime show much electrical charge upon the particles.
4. Putties made by slaking quicklimes with excess water usually contain particles that are quite highly charged and are very plastic.
5. The hydrates that do not give plastic putties after soaking show no indications of having charged particles, either before or after soaking.
6. On applying the Donnan membrane equilibrium equation to the charged particles of lime in a putty, the theory is developed that the plasticity of a lime putty depends upon a film of water held around each particle by a force depending upon the charge held by the lime particle itself. The amount of charge on the lime particles of a putty varies with the different limes.

[8] Trans. Am. Electrochem. Soc., 21, 233 (1912).
[9] *Electrochem.*, 17, 572 (1922); Bogue, "Colloidal Behavior," Vol. 1, p. 19. McGraw-Hill Book Co. (1924).

Plastic Magnesia Cements

A RECENT bulletin entitled "Plastic Magnesia Cements" has been issued by the Dow Chemical Co. of Midland, Mich. This is the Magnesium Chloride Service Bulletin No. 9, and is a revision of the subject matter of all the previous bulletins together with considerable new data. The bulletin contains chapters on methods of testing, active ingredients of plastic magnesia cements, aggregate grading, water and weather resistance of plastic magnesia cements, application of plastic magnesia stucco, installation and wearing of flooring, setting time, volume change, colored products, and chemical analysis. The work is thoroughly illustrated throughout with halftones, drawing and charts. It sells for $5 a copy.

Nearly 80 tables are included in the bulletin and present the data in a clear and concise fashion. The tables include data on physical and chemical tests made in the study of this particular type of cement. This book is chiefly given over to the physical and chemical properties of the plastic magnesia cements, but there is also considerable data on the application of this material, such as for stucco, flooring and pre-cast units. These uses are well illustrated by cuts and drawings, particularly the use of colored stucco.

Peanut Shells in Gypsum Fiber Concrete

THE USE OF GYPSUM FIBER CONCRETE and structural gypsum has created a demand for wood chips, which are mixed with calcined gypsum and water to form the concrete. These chips are hardwood planer shavings not over 1 in. in the longest dimension and not over 1/16 in. in thickness, being used in amounts varying from 0 to about 15% by weight of the dry mix. The quantity demand is sufficient to make the price of wood chips an appreciable item in the cost of construction. The use of peanut shells, now a waste product which can be secured at a price slightly higher than the transportation cost, to replace the wood chips in gypsum fiber concrete, has been considered at the bureau.

Two types of gypsum were used in the following determinations: Gypsum I, a first settle, kettle calcined gypsum, and Gypsum II, a first settle, rotary calcined gypsum. These gypsums are representative of the calcined gypsum on the market for structural purposes. The following nomenclature is used throughout this article: Roman numerals I and II indicate the type of gypsum; the next figure, that is 90 or 97, the percentage of gypsum by weight of the dry mix; the nevt, that is, 3 or 10, the percentage of wood chips or peanut shells, by weight of the dry mix; and the last figure, the amount of mixing water, expressed as percentage of the dry mix. The results obtained are given in the accompanying table.

Mix	Specimen size (cylinders) Inches	Aging conditions	Compressive strength Peanut shells Lb./in.²	Compressive strength Wood chips Lb./in.²
I-97-3-60	6 by 12	Oven dried	948	1318
II-90-10-60	6 by 12	Oven dried	277	682
I-97-3-60	3 by 6	Air, 7 days	1284	1815
	3 by 6	Air, 14 days	2603	3017
	3 by 6	Air, 28 days	2517	3053
I-90-10-70	3 by 6	Air, 7 days	846	931
	3 by 6	Air, 14 days	1238	1631
	3 by 6	Air, 28 days	1341	1549
II-97-3-60	3 by 6	Air, 7 days	1327	1945
	3 by 6	Air, 14 days	1482	2653
	3 by 6	Air, 28 days	1977	2609
II-90-10-70	3 by 6	Air, 7 days	591	1051
	3 by 6	Air, 14 days	747	1722

Although the results, as a whole, indicate less strength for the peanut-shell mixes than for the wood-chip mixes, there is still a possibility that the peanut shells may be substituted for the wood chips in gypsum-fiber concrete. The lower strength of the cylinders containing peanut shells is presumed to be due to the decaying of the shells before the gypsum dries out. An odor leading to this presumption is very noticeable with all the cylinders containing the peanut shells. It was also noticed that the strength of the 3x6-in. cylinders containing peanut shells was closer to that of the cylinders containing wood chips than in the 6x12-in. cylinders. This is thought to be due to a greater decay in the peanut shells in the larger cylinders, which dried more slowly. The use of disinfectants to prevent decay is now being considered.

Enforcement of Material Specifications

By P. J. Freeman
Chief Engineer, Bureau of Tests and Specifications, Allegheny County, Pittsburgh, Penn.

THE ORIGINATOR of that classic phrase—"It's a great life if you don't weaken"—must have been a highway materials engineer. Nothing can destroy the usefulness of an inspection department more quickly than the lack of firmness on the part of the engineer in responsible charge of such a department. Only a man with long training in the business of inspection of materials can recognize at once those things which require firmness in order to preserve the life of the inspection system and at the same time he must be able to differentiate from those things which, although important in the matter in hand, do not lend to ramifications if moderate concessions are made.

All inspectors must be fair and just to the material producer, the contractor and the purchaser. Only properly trained engineers, chemists and inspectors know enough to be fair as well as honest. Such men know the percentage of error in sampling and testing a given material and do not reject materials through errors in testing or snap-judgment. Granted that the material does not comply with the specifications governing the contract, then the inspection department must keep such material out of the work even though they have to fight every construction engineer on the job in addition to the material producer and the contractor. Change the specifications when a new contract is to be let but do not "weaken" in the enforcement of specifications governing a contract which is already under way.

Specifications Must Be Enforced

Specifications for materials must be developed with a thorough knowledge of the sources of supply as well as the quality of the materials suitable for any particular kind of work. It is not fair to expect an inspection bureau to enforce specifications written by engineers who are not specialists in materials and therefore are not capable of writing a specification which can be enforced. The co-operation of the construction divisions with the inspection bureau should develop specifications which cover available materials suitable for the work in hand and thus the necessity for changes in specifications is entirely eliminated.

In establishing a bureau of tests and specifications it is necessary to obtain the co-operation of the construction bureaus whose heads have been writing specifications without regard to those used by other bureaus, and endeavoring to enforce them without sufficient assistance. They should be given to understand that the knowledge of the engineers, chemists and inspectors is always available for advice on every problem coming up in construction as well as in the writing of specifications.

In order to obtain this co-operation a very definite policy should be established and the word passed around that the representatives of the bureau of tests and specifications are not detectives whose duty it is to detect failures to comply with the specifications *after* the work has been done. Unless they are active enough in following out their obligations to prevent bad materials from going into the work, they have failed in the purpose for which such a bureau was established. It is far better to spend time in testing materials, accurately setting a batcher plant, and in requiring the contractor to have adequate equipment for doing a job *before* he starts the work than it is to find out that the contractor has been cheating after the work is under way.

Aim Is Not Rejection of Material

The full value of a bureau of this character is not reflected in the number of tests completed nor in the rejections made of unsuitable material. Assistance should be given to the material producers and contractors in obtaining satisfactory materials and incorporating them in the work. Rejecting unsatisfactory material is a negative procedure involving trouble and loss for all concerned.

The prevention of the shipment of such material to the job is constructive co-operation. This does not mean that inspectors shall always test and approve materials before they leave the plant of the producer, but through co-operation with the producer he is given to understand exactly the quality and kind of materials required and usually his own inspection forces can prevent materials from being shipped which would be rejected after arrival on the job.

It seems needless to say that the head of a bureau of tests and specifications must have complete backing from the highest executive in the organization, and some provision should be made in the system of handling payment for the work so that the responsibility for the final estimate is a joint one with the construction division or bureau. In our case all current estimates for steel used in bridge construction are approved monthly for quantity and are checked to see that the material listed in the invoices has been tested and approved by the bureau of tests and specifications. When a pavement has been completed this bureau sends a core-drilling machine over the job taking samples at intervals and a joint report is made by the bureau of roads and the bureau of tests and specifications stating the results determined by the core drill and recommendations for payment. Until this joint report has been received for the final estimate the county controller will refuse to approve payment. This gives an opportunity for the inspection bureau to enforce the requirements of the specifications while work is in progress, which it would not have if it were unable to exert a financial pressure on the contractor.

Method Used for Enforcement of Specifications

The specifications of Allegheny County require the contractor to submit in writing immediately after signing the contract information as to whom he proposes sub-letting any portion of the contract whether for materials or labor or both. Officially the county does not deal with any sub-contractor, but the main contractor who is under bond to the county is required to be responsible for the quality of all materials purchased by him. In actual operation, however, we have our ordinary dealings directly with the sub-contractors and the material producer unless these dealings are such that they should come through the original contractor. This method is pursued so long as the material producer is co-operating with us and furnishing satisfactory materials, but if he fails to do so, he is immediately ignored and pressure exerted on the main contractor which will require him to obtain a new source of supply if necessary.

The specifications further require the

*Extracts from a paper presented at the Michigan Conference on Highway Engineering, Ann Arbor, February 21, 1929.

contractor to furnish representative samples before placing his orders, and he must apply in writing for permission to purchase materials from any given source, and approval in turn will be given him in writing if that source of supply is satisfactory and capable of furnishing the material. The following extracts from our specifications give what we believe to be the keynote of the combination for enforcement of material specifications.

After the approval of source of supply of the material has been obtained the contractor shall immediately furnish two copies of the order for this material to the Bureau of Tests and Specifications. All orders shall carry the notation—THIS MATERIAL MUST MEET THE REQUIREMENTS OF ALLEGHENY COUNTY SPECIFICATIONS AND IS SUBJECT TO INSPECTION BY THE BUREAU OF TESTS AND SPECIFICATIONS.

When required by the director the contractor shall furnish invoices showing the total quantity of cement shipped for use on our contract, together with a statement of the amount used and unused.

The specifications further require the contractor to furnish all material for testing and under certain circumstances he must store and handle concrete specimens as prescribed under the specifications.

Approval of Sub-Contracts

It is needless to say that in granting approval for the placing of sub-contracts for concrete materials, etc., that such approval must be based solely upon the ability of the material producer to furnish such materials promptly and of a quality which will comply strictly with the specifications. This work is handled solely by engineers who are "technical" appointees, and in no way directly responsible to political influences. If the main contractor requests permission to place a sub-contract with a material producer who has never furnished such material to Allegheny County, a representative of the bureau makes a careful inspection of his facilities for furnishing such materials. The material producer is definitely informed concerning the requirements of the specifications and he is therefore in a position to furnish such materials if he obtains his sub-contract.

We have found that material producers are quite willing to install new screens for properly grading stone or make similar arrangements in order to produce materials complying with the specifications, provided they do not yet have the contract. The approval of the sub-contract is therefore contingent upon the subcontractor's agreement to do certain things necessary for the proper preparation of his material or its delivery.

This procedure immediately brings the main contractor and his sub-contractors into direct relations with the bureau of tests and specifications and they are thus brought to realize that the material specifications are to be enforced.

Correlation of Specifications

By correlating specifications so that every bureau uses exactly the same kind of material in the same way for similar purposes, it is possible to enforce specifications more readily. We also found that by adopting the Pennsylvania state highway specifications for materials which were available in our district we had the assistance of a larger user of materials. Producers knew state requirements and were equipped to furnish such materials of a quality required by the state. We also endeavored to have the city of Pittsburgh and surrounding boroughs adopt the same specifications and to a considerable extent this has been done. By thus eliminating some of the varieties of material prescribed by different municipalities a more uniform product was obtained by all concerned.

Identification of Jobs and Samples

At the time a project is advertised it is given a consecutive job number which covers that contract. All samples of every kind connected with that contract bear the job number in addition to the number of the particular sample. This simplifies clerical work in the office and makes it impossible to confuse samples from jobs having similar names. All reports are filed under the job number and a triple index makes the file readily accessible.

Listing Jobs and Material to Be Tested

When the contract is signed the job number and name are posted on a large sheet together with the name of the contractor and the resident engineer assigned to the job. This sheet carries every item of material used in construction and each item required on a given contract is checked in the proper column. The date on which the final letter is sent to the contractor instructing him to communicate with the bureau is recorded and likewise the first date on which he replies. A separate tickler system calls attention to the first letter sent out, and if that does not start the new contractor to writing letters he is given a second chance and then the construction bureau is notified. Even though no materials are to be used for sometime the contractor is not allowed to proceed by the resident engineer until an armistice has been signed by the bureau of tests and specifications and the contractor who usually hunts us up as quickly as gasoline can get him there.

The contractor then knows exactly what is required even though he never read the specifications before bidding on the work, and he has no excuse for failure in the future to comply with the requirements of our specifications.

When tests are started on any particular material the fact is noted on the sheet and from then on the clerk's records in the laboratory keep the testing going at the proper intervals. The use of this sheet is based upon the theory that most of the sins of a contractor are those of omission, and we have found that the contractors are willing to co-operate and can usually assign their stenographer or purchasing agent to the duty of keeping us properly advised concerning permission to place sub-contracts and furnishing copies of orders. It is necessary to leave nothing to the contractor which can readily be directed from the bureau and a glance at the sheet shows materials which have not been placed under test for the first time.

The resident engineer on each job should see that every material used has been properly tested and approved, but this system serves to enforce the specification in case the resident engineer fails to do so and it is also an assistance to him on account of the fact that the man in the field has many construction details to occupy his time.

Keep the Work Going

It is our policy to keep the testing done ahead of the need for material even though it requires overtime and Sunday work. If the contractor orders these materials in plenty of time the tests can usually be completed with ease. The use of the sheet listing the jobs and materials enables an engineer in the bureau of tests and specifications to anticipate the requirements of the contractor, and his attention is called to the fact that we have not yet received copies of his orders for such materials. Even though there are fifty or more projects going at one time it takes but a few minutes to check over the materials being tested for all. The chief engineer of the bureau and his assistant are constantly driving over the county inspecting each job under construction and therefore the bureau head is in constant touch with the progress of each piece of construction. The bureau of construction make a daily report to the director of public works with copies to the bureau of tests and specifications giving the daily status of every job. This makes it possible to visit jobs which may be in particular need of such visits.

Inspection of Highway Materials

All materials used for coarse aggregates are inspected after arrival on the job by the resident engineer and tests are made by his inspector. We feel that the man who is capable of passing on the placing of the concrete is equally qualified to accept or reject the materials going into it. The bureau of tests and specifications furnishes complete field equipment for this purpose and when necesary carefully instructs the inspector in proper methods.

In case of dispute over the quality of concrete aggregates or at the request of the resident engineer a representative of the bureau makes a field inspection and if necessary brings samples to the labo-

ratory for final tests and a decision is rendered by the chief engineer of the bureau of tests and specifications.

Cement is tested under contract by commercial testing laboratories and loaded from bins and each car tagged with a county label. We have found this to be cheaper and more satisfactory than hadling the cement testing by our own forces, but it is the only material not tested by our bureau.

Trucks from the bureau of tests and specifications are driven by material testers and they visit the jobs at least once each week and in addition to an inspection of general conditions they obtain samples of cement, sand and aggregate which are taken to the laboratory for complete tests.

The resident engineer and inspector make concrete cylinders daily which are stored in the field and picked up by the bureau trucks for crushing tests in the laboratory. In addition to these daily tests the resident engineer also prepares beams for testing concrete at important intersections. Beam testing machines are furnished in the field by the bureau of tests and specifications and a representative witnesses the breaking tests of such beams in the field and the time of opening a road is authorized by the joint approval of the chief engineers of the bureaus interested.

We endeavor to test as many materials at the source of supply and in the field as possible, reserving the laboratory for chemical and physical tests which require special equipment and trained chemists and laboratory operators. We keep in mind the idea of having bureau representatives available for service in the field either in matters requiring special investigation, controversies in case of dispute, or assisting in the instruction given to new assistant engineers and inspectors.

Co-operation Necessary to Enforce Specifications

Without the co-operation of every man in the construction bureau from top to bottom the bureau of tests and specifications would have a hard time. One way of obtaining such co-operation is to keep constantly pointing out horrible examples of bad construction both at home and abroad and insisting that, "the best is not good enough."

It has been found worthwhile to make inspection trips to point out failures due to unsound aggregate, lean mix and poor design and construction in bridges and roads. It is surprising to find how many engineers have not observed the failures which are taking place in roads and structures all around them. In general, it is easier to notice failures in highways than in masonry, but when an engineer once becomes critical and realizes that the structures which he has been building are not permanent he will then be ready and willing to co-operate with a testing department to the fullest extent in order to eliminate that one variable inferior materials from the many which enter into modern highway construction and thereby becomes a loyal supporter of the bureau of tests.

California Manufacturers Meet Frankly an Investigation of Cement Prices

A COMMITTEE of the state senate of California has been investigating the prices of cement and the sales methods of manufacturers of cement. The purpose of the investigation was to see if more stringent legislation than that of the present antitrust laws of the state should be passed in order to protect the people from combinations in restraint of trade.

Sessions of the committee were held in San Francisco and Los Angeles. At the Los Angeles session a large part of the three-day meeting was given to hearing testimony that identical or nearly identical prices were quoted by dealers and manufacturers whenever bids for cement to be used on public works were called for. The committee's attorney tried to make a point of the fact that the four companies investigated were in an association but this was freely admitted by the companies and its lawful purpose was explained.

The inference the committee's questioner tried to draw from the similarity of price was that it was an agreed price. E. E. Duque, general manager of the California Portland Cement Co., was asked to explain how, if there was no agreement as to price, bids could be identical. According to the *Los Angeles Times:*

"Mr. Duque said the reason his company's bids for public works cement contracts virtually always are identical with those of the other three companies is because the bids are based on the published prices of the Riverside Portland Cement Co. He said the companies know that the Riverside company will bid its published price and that the other companies bid the same so as not to begin a price war.

"Senator Jones asked him how his company manages to get a fair share of the cement business when all bids are identical. Mr. Duque said that on private work the company depends on winning the contract by business, social and salesmanship influences. On public work, he said, salesmanship is depended on.

"John Treanor, president of the Riverside company, was called to the witness stand and it was drawn from him that his company is the only one that publishes a price list and that it circulates the list among the cement companies and dealers, and that anybody may have one on reasonable request. He said his company is larger than any of the others and that when it comes to bidding the other companies cannot bid higher than his company, which bids the published price, without forfeiting hope of getting the business.

"Mr. Treanor said that other companies have complained on occasions that his prices were too low and that he gave consideration to the complaints, but never issued price changes on account of them. Price changes, he testified, are made for production and competition reasons. He denied as firmly as Mr. Duque that there is the slightest degree of collusive price-fixing among the four companies."

At a later session Mr. Treanor was asked what prevented the companies from putting the price at any point they pleased. He replied that the price was determined not only by the cost of production and distribution but by competition with other materials, instancing the use of asphalt in paving as such competition.

Regarding the association of the four companies, Mr. Duque testified: "'A statistical association,' which meets every two or three weeks, but that it never discusses price fixing. He said it employs an attorney to keep it from discussing matters inhibited by anti-trust laws."

The investigation committee tried to have the companies bring their books into the sessions so that the costs and profits of cement making might be shown. The request was denied on the ground that such matters were trade secrets and to divulge them would give rivals an unfair advantage. The attorney for one of the companies reminded the committee that it was not a grand jury and the companies were not charged with having committed any crime.

The Riverside company did set out, however, that its earnings for the past six years totaled $6,000,000, but, according to the *Times'* report: "President Treanor of the company pointed out that this gave no evidence of what the company earned on the value of its property and added that some of the earnings came from oil lands, stocks in other companies and other non-cement operative properties. Further information along that line was withheld.

"Mr. Treanor's general attitude toward the committee, however, drew a compliment from it because of his willingness to provide whatever information he was not directed by the company's attorney to withhold.

"'There is nothing that we do in marketing our product,' Mr. Treanor testified, 'that is not in accord with the Federal Trade Commission's principles of fair business competition.'"

He testified that cement prices in southern California are lower generally than such prices in western states and that the companies do not take exorbitant profits, even when it is possible to do so, giving specific instances. Cement prices, he testified, are lower generally, according to analytical curves, than prices of other commodities.

Rough Estimation of Tonnage of Stone and Gravel Deposits

Short Methods Which Give Results Accurate Enough for Many Purposes

By Edmund Shaw
Contributing Editor, Los Angeles, Calif.

A TON OF ROCK is "13 cu. ft. in the solid, 18 ft. blasted and piled, and 21 ft. in the sand pile." This is an old rule, a miner's tradition, but it has the advantage of being easy to remember and it is often useful for quick mental estimates. It is based on weights of 154 lb., 111 lb. and 95 lb. per cubic foot for the solid, broken and finely crushed rock. The weight in the solid is a little lighter than the weight of average rock, but there is no harm in having a little margin for seams and cracks.

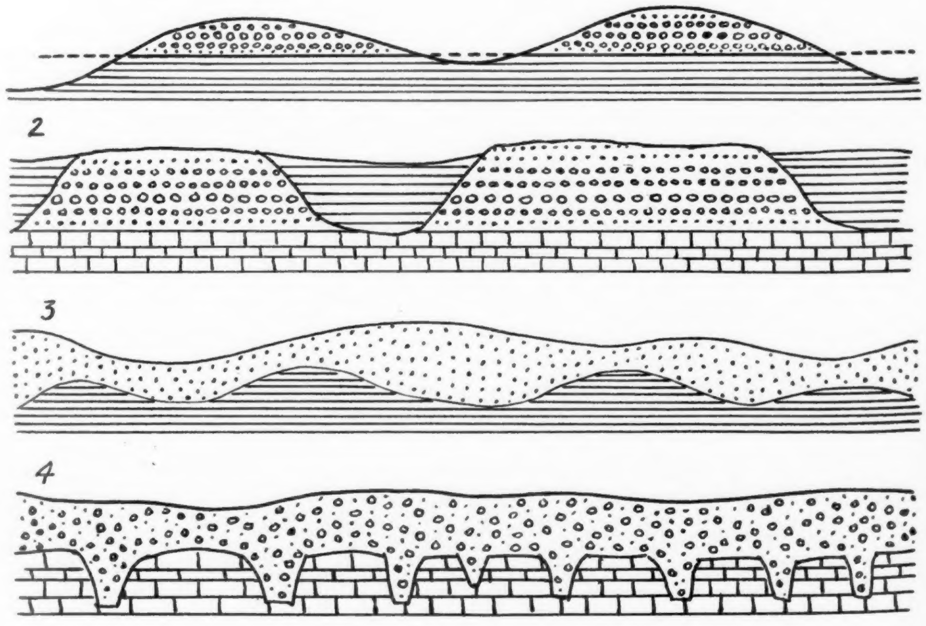
Of course the only way to have the tonnage of a rock deposit determined as a basis for a large-scale commercial operation is to have the ground surveyed and drilled, the work being done under the direction of a competent engineer. Then the weight per cubic foot and other characteristics of the rock may be determined in the laboratory and both the tonnage and the value may be determined with some certainty. But this is expensive and there are times when neither time nor money is available for an estimate of this kind. In such a case the rough estimate must serve, and it is worth many times the trouble it costs to obtain. A famliiar example is the "sizing up" of a property with a view to purchase.

But just because an estimate is to be an approximation does not mean that it should be carelessly made or that any way of making it more accurate should be neglected. It is very easy, for one thing, to get the weight per cubic foot with some accuracy without going to very much trouble, calculating it from the specific gravity. The specific gravity methods indorsed by the American Society for Testing Materials and the American Association of State Highway Officials are both simple, and if they cannot be used there are tables of specific gravities in almost every engineer's handbook. Figures that may be carried in one's head for the commoner rocks are: Sandstone, 2.2; gypsum, 2.3; limestone, 2.6; dolomite, 2.8; granite, 2.8; and trap (basalt), 3.1. Based on these specific gravities, using the same allowance for cracks and seams as was used in the 13-ft. estimate, the figures are, for one ton in the solid, sandstone, 15 ft.; gypsum, 14½ ft.; dolomite or granite, 12½ ft., and trap, 11 ft. Every quarryman will probably be able to instance rocks that are heavier or lighter, for the above figures are only averages. And rocks vary considerably in specific gravity, one table showing variations from 2.46 to 2.86 for limestones, from 2.50 to 2.70 for granite, and from 2.80 to 2.90 for dolomite. But errors arising from faulty assumptions of area and depth are liable to be as great as those arising from assigning too low or too high a weight per cubic foot.

Weight of Sand and Gravel in Place

Sand and gravel deposits of the ordinary kind, in which only a small part of the material needs crushing, weigh from 110 to 125 lb. per cu. ft., dry. Where the material is largely boulders, as it is in some of the glacial deposits of Ohio, Illinois and Wisconsin, and "washes" composed of large pieces as in California, the weight per cubic foot is considerably more. For this reason it is impossible to assume a weight per cubic foot that can be used in all cases with satisfaction even for the roughest estimates. For in addition to differences due to the grading of the material in the ground, which makes more voids in one place and less in another, there is the loss from screening and washing to be considered. In deposits of which only a small part requires crushing this loss is usually from 15% to 25%. The writer remembers one deposit in which the loss was only 10% and another in which it was 50%. The working of the latter was only justified by the high price of sand in that locality, as the washing and screening and the disposal of the waste were all difficult.

Several producers have told the writer that they considered 100 lb. to the cubic foot to be a fair average recovery, but this is probably too high, and 95 lb. would be a safer figure to use. But in the case of investigating new ground, in a locality with which the investigator is unfamiliar, it would be worth the time and trouble it would take to arrive at a closer figure. If there are no pits working in the locality there are usually cuts for railroads and highways through similar deposits in the same locality, assuming that there is no time to sink test pits, from which samples may be obtained. In the case of deposits which are wholly or in great part below water level there is no chance for more than a blind guess before the deposit is really prospected, unless one can draw conclusions from properties that are being worked in the neighborhood of the deposit



Sections of typical deposits, indicating how a knowledge of the geology of the particular region will help in determining the extent of the deposit

that will justify something more. In estimating the loss from screening and washing it should be remembered that the loss is less with coarse material than with fine, and less with deposits under water than with deposits above water, although there are exceptions to both those rules.

Estimating Area and Depth of Deposits

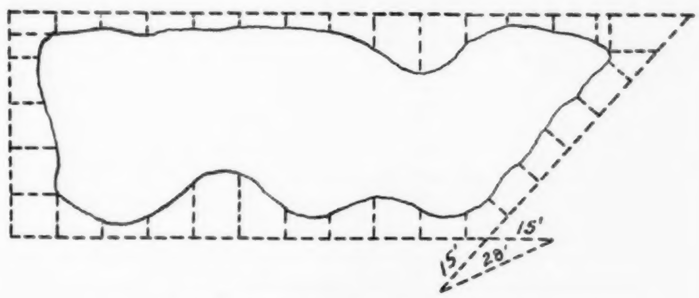
In estimating the dimensions of a deposit the hardest figure to obtain is the depth. This is true even where the ground has been test-pitted or drilled, for a drill hole after all shows only what the drill brings up, and a different condition altogether might be shown by a hole placed a short distance away. So estimates that have been made in the most careful manner sometimes fall short or run over to a disturbing degree. But the probabilities are that if the sample from one hole is the same or nearly the same as the samples from adjacent holes, they represent the ground between them, and it is on this chance that money is invested and work begun.

Where the ground is not opened the depth of the deposit must be estimated from such information as can be had, and geological maps and reports are the best sources. These have been compiled from practically all the information that was available at the time they were made and the information has been edited and combined by a man who is thoroughly familiar with such matters and who knows the stratification in a large way. Almost all state reports contain a report on each county, and some of them give much detail. If there is time to secure it, the state geological departments can probably furnish later and more detailed information than is given in the published reports. The astonishing thing is that so few men who have to make estimates of this kind consult the geological department of the state in which the deposit is located. Many do not even go to the trouble of securing a report.

In addition to what may be had from maps and reports there is information to be picked up from quarries or pits at work in the locality, from drillers of wells and others familiar with the territory. But there is always the chance that some of this may be misinformation, and one should know enough of the ground to be able to check it in some way before deciding to accept or reject it.

Geology Necessary

A knowledge of the geology of the deposit is absolutely essential for the estimation of tonnage in some cases. A few of them are shown in the accompanying illustration. No. 1 shows a section through a sand and gravel deposit of a type found in the Atlantic Coastal Plain, and the writer has seen deposits of this kind being worked in New Jersey, Virginia and North Carolina. All the sand that is worth recovering and the gravel lies above a certain elevation, the reason being that the continuous bed that was laid down originally has been much eroded. Where the hills are low and rounded the caps of gravel may thin out to an unworkable depth at the edges so that a great part of the area is of little value. No. 2 shows a type of deposit common in the Trinity River district of Texas. The deposit of sand and gravel has been eroded and the erosion channels have since been filled in with alluvial clay. The outline of such deposits sometimes shows quite plainly on the surface because the vegetation on the deposit is scantier. No. 3 shows a deposit which was laid down on eroded ground and afterwards eroded in channels which run in a different direction from those below. The gypsite deposits near Quannah, Texas, are of this type. No. 4 shows a condition found in the Tennessee rock phosphate fields where the limestone on which the phosphate ground rests is cut by many narrow channels, locally called "cutters." Somewhat similar conditions, but on a larger scale, are found in some sand and gravel deposits in eastern Texas, where the material has been deposited over old river channels in limestone.



A method of roughly estimating the area covered by a deposit

Deposits of glacial material often call for some knowledge of the glaciation of the district in which they are located. Thus in Iowa there are three glaciated areas, one of which, the Wisconsin, contains good sand and gravel, while the others do not contain it in workable deposits. Even in the Wisconsin area there are localities which contain too much shale to be workable, so that the largest tonnage of good material will be found in stream beds and outwash basins. In all of the glaciated areas it is important to know where the principal moraines lie, as both the tonnage and the quality of the material may vary according to the distance it has been transported. And naturally one should be able to recognize the type of glacial deposit; for in an esker, for example, good coarse material may be found near the source, while only unwanted fine sand will appear further down. Or perhaps, as is the case in some deposits in New York state, the coarser material may have been overlaid with fine sand by later flows.

Turning to the solid rocks, one finds sandstones of the highest grade of silica sand in which a part has been cemented by a silicious material or otherwise consolidated so as to form a quartzite. While this may not be present in large amounts, it may add to the difficulties of quarrying so as to reduce the available tonnage. The presence of fine seams of shale or of strata of chert may greatly reduce the amount of salable material, as some quarry men have learned at great cost in parts of Missouri. But the deposits that perhaps call for the greatest knowledge of the geology of the country are those which have been faulted and folded, as in Pennsylvania and other states crossed by the Appalachians. It would seem wise to leave the consideration of these to those who are familiar with them and with the country. Even then there is a chance for mistakes. There is a case on record of a cement company that quarried limestone for years some distance from its plant, not knowing that the same limestone stratum was folded under its cement rock quarry to a point at which it could be quarried very cheaply.

Testing Deposits

Taking such geological conditions as those noted into consideration, it would appear that even the roughest tonnage estimations should not be made without finding out what is below the surface, and this is especially true of sand and gravel, phosphate rock, gypsite and similar deposits. A few test pits add greatly to the information obtained from other sources. The danger is that a few test pits will be taken to prove too much, so that later systematic drilling or test-pitting will be neglected. This has been impressed on the writer's mind by a somewhat recent instance. He was asked for an opinion on the method of screening and washing the material from a deposit, and in the course of the conversation it developed that the deposit had not been systematically drilled. As what little work had been done had shown clay seams to be present, and as larger ones were known to exist in nearby workings, it was advised that no more money be spent until the ground was thoroughly proven. The company decided to take a chance and go ahead without further drilling, but the ground had to be abandoned before the end of a year.

For preliminary investigations the test pit is to be preferred, as it does not call for setting up the rig that would be necessary to use a bucket or a gravel pump, such as is used with the systematic prospecting of the ground that comes later. The great advantage of a test pit is that one can get into it and examine the face to see how the material lies. The information gained in this way is sometimes worth a great deal in deciding on the workability of the deposit. Where the test pit cannot be sunk, the small orange-peel bucket in a pipe or a gravel pump must be used. The method of using

the orange-peel bucket, which can be bought from any of the bucket manufacturers, has been described several times in Rock Products, and the gravel pump was described in the "Hints and Helps" section of the issue of April 28, 1928.

Underwater deposits are sometimes sounded with a steel rod to determine their depth. A piece of drill steel sharpened to a point will serve. This is the method by which river-bed deposits are prospected, and those who are familiar with it make quite successful use of it. They are able to tell by the feel and the resistance to driving when the rod enters and leaves the sand and gravel. The method has been used to find the depth of phospate rock deposits. It needs practice and some familiarity with the ground. Of course it cannot be used in deposits that contain many large pieces.

Estimation of Distances and Areas

The rock products industries are almost wholly situated in well settled localities and there is little need for one to be a surveyor in making rough estimates of tonnage and value. It is almost always the case that the land has been surveyed and that the elevations are known. It will be the rare occasion that will call for a rough survey with a pocket compass and aneroid such as mining engineers are frequently called upon to make. At the same time some knowledge of such matters is necessary. If one is examining a large territory looking for a deposit of a particular kind, a map and a pocket compass are necessary and a pocket aneroid is a good thing to have. Another case where an elementary knowledge of surveying is necessary is that of irregular shaped deposits, and such deposits as that shown as No. 2 above are often quite irregular in shape. The determination should be as accurate as time and other circumstances will permit it to be. If there is little time a few points may be tied in to lines on the plat and the remainder of the contour drawn by eye. If there is more time, lines may be staked and offsets measured as shown in the diagram. The angles may be found from bearings taken by a pocket compass, or the three sides of a triangle may be measured as shown at one of the angles. If a plot of this kind is laid out on the squared paper that can be bought in any stationery store, punched to fit the notebook, the area can be found easily by counting the squares enclosed. A strip of the same paper may be used as a scale, calling the side of one of the squares 5 ft. or 10 ft., whichever is most convenient.

A 100-ft. steel tape is almost essential for this work. If it has been left behind, the line may be measured with two 10-ft. poles, placing one at the end of the other, without losing so very much time. Right angles may be turned off by measuring a triangle of 3, 4 and 5 ft. sides or multiples of these. A carpenter's square and a level are friends indeed when no other instruments are available. With these and an elementary knowledge of triangles, some ingenuity and a good helper, one can do many things. The angle of a slope may be measured with them, for one thing.

The methods given above are all so elementary that one feels like apologizing for printing them here. But the idea is rather to suggest than inform. It goes without saying that no such makeshift methods should be used when an engineer with his instruments is available. It will save both time and money in the end to employ him, besides removing one source of inaccuracy in an estimate that is none too accurate at the best.

Resourcefulness and good judgment are the qualities needed when one is called upon to make estimates of the kind described here. If information cannot be had in one way, then another way must be found to get it. And judgment is necessary to weigh and value the information that is obtained. The worst mistakes come from deciding too quickly and from assigning too much importance to one piece of information and not considering how it checks up with the remainder.

No California Cement Trust

WILLIAM H. GEORGE, of San Francisco, Calif., who is president of the San Francisco Builders Exchange and vice-president of the National Association of Builders Exchanges, has given an interview to California papers concerning the price of cement in that state. This has been recently investigated by the California state senate and there is talk that some anti-trust legislation directed against the cement industry of the state may result. According to the *Los Angeles Times*, Mr. George said:

"There is absolutely nothing in the cement business that has any connection with or similarity to a trust; there is no restraint of output; there is no division of territory; there is no division of sales. Cement manufacturers are out hustling for business.

"There is a market price and that price might prove interesting to the public in view of what has been said and what has been intimated.

"On May 4, 1918, the War Industries Board's price-fixing commission, after exhaustive investigations of the cement situation, fixed the localities of Crestmore, Davenport and Cement, Calif., as basing points for the cement industry in the west and fixed the basic price applicable from those points at $2.65 a barrel.

"Today, in spite of the rising costs of production, the basic price is $2.45 a barrel, or 20 c. under the price which the United States government felt was the minimum manufacturers could use as a starting point to figure a profit.

"The chief element of difference between companies to be taken into consideration in quotations centers around freight rates and the manufacturers have found by experience that this difference, represented by a certain rate to a certain point and a higher rate to another point, averages up when the basing points established by the government are thrown into the scale against each other.

"Hence it is not surprising that manufacturers, taking the average for their computations, will come out almost at the same figure.

"Another element which enters is that prior to the building of cement plants in California, all cement used here was imported. The bulk of it came from Europe and it cost from $3.50 to $4 a barrel.

"Home production has cut nearly $1 a barrel from that price and yet the cement business is without a protective tariff.

"To complete the picture, if any more cement plants get into business in California, the condition of the industry and the building industry is going to work into a situation where it's going to be a survival of the fittest once again. Someone will suffer."

Atlantic Gypsum Products Co. Plans Nova Scotia Expansion

IT is stated that the Atlantic Gypsum Products Co., New York City and Portsmouth, N. H., has extensive plans involving the expenditure of some $600,000 in gypsum development work at Cheticamp, Cape Breton. Among the details will be the erection of a large modern mill in which the raw material will be crushed and made ready for the markets in upper Canada. It will mean, so it is believed, steady employment for some 300 men all year round.

This enlargement, it is believed, is made necessary to meet the gypsum requirements of the Canada Cement Co., Ltd., which will, in the future, be supplied by the Atlantic Gypsum Products Co., which also controls gypsum areas in other sections, including deposits of white gypsum.

It is also stated that the operations of the Canada Cement Co. through its subsidiary, the Canada Gypsum Co., at Antigonish, N. S., are to be abandoned in favor of the Cheticamp development because of cheaper production at the latter place.

Price Stone and Lime Co. Sold to Kentucky Stone Co., Inc.

THE quarry near Wheeler, Va., which has been owned and operated by the Price Stone and Lime Co., of Gibson Station, Va., for the past fourteen years, has been sold to the Kentucky Stone Co., Inc. W. B. Paint, the president of the latter company, will have active charge of the quarry. He has been in the quarry business for a number of years at High Bridge and Tyrone, Ky. R. M. Price, president of the Price company and W. R. Pool, secretary of that company, have sold their holdings in the quarry. The plant has a capacity of about 140,000 tons annually.—*Middlesboro (Ky.) Three-States.*

Study of Quarry Costs*

Some Results of Questionnaires Returned to the U.S. Bureau of Mines

By J. R. Thoenen
Mining Engineer, U. S. Bureau of Mines, Washington, D. C.

DURING the year 1927 the Bureau of Mines, at the request of a number of quarry operators, undertook to make a study of quarry-operating costs in order to determine average costs for certain operating conditions and to suggest a model cost accounting system for quarry operations.

A detailed questionnaire was prepared and mailed by the bureau to all quarries on its records as employing ten or more men in 1926.

The questionnaires were received by the operators during the height of their production season, and for that reason many replies were delayed. The success of any study of this nature necessarily depends upon a large volume of replies, so that comparable groups may be segregated and averages presented without disclosing any single operator's figures. This makes necessary the hearty cooperation of the whole industry.

Tabulation of Results

In order to acquaint the industry with concrete evidence of the object and value of this study, the replies from producers of limestone received up to November 1, 1928, were tabulated and presented to the National Crushed Stone Association at its annual convention in Cleveland in January, 1929. Considerable interest was aroused and many operators who had not previously contributed statements promised immediate cooperation with the Bureau at that time.

With this encouragement the bureau has decided to make general distribution of the compilations to date with the hope of stimulating further interest and thereby obtaining a larger volume of data from which to compile the final tabulations. Copies of the preliminary tables are published herewith.

Operators are requested to study these tables carefully and criticize them freely. Suggestions are solicited and welcomed as to alterations or additional groupings tending to bring out information not already shown, so that the final report when completed will present the greatest possible amounts of information.

It is hoped that all possible returns will have been made by June 1, 1929, so that

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TABLE 1.—QUARRY AND OVERHEAD COSTS PER SHORT TON, 1927

Stone for:	Loading method	Number of quarries	Average daily stone production	Average quarry cost	Per cent	Average quarry crushing cost	Per cent	Average overhead cost	Per cent	Average total cost
Lime	Hand	6	134	$0.86	70	......	....	$0.36	30	$1.22
Lime and crushed stone	Hand	6	237	......	....	$0.79	72	0.30	28	1.09
Lime and crushed stone	Shovel	6	1023	......	....	0.57	63	0.34	37	0.91
Lump and rip rap	Hand	6	248	0.81	73	......	....	0.30	27	1.11
Crushed stone	Hand	15	331	......	....	0.94	80	0.23	20	1.17
Crushed stone	Shovel	12	1200	......	....	0.63	75	0.21	25	0.84
Pulverized stone	Hand	5	93	......	....	0.95	74	0.34	26	1.29
Cement	Shovel	33	1243	0.35	62	0.42	75	0.14	25	0.56
Cement	Shovel	2	310	......	....	0.60	70	0.25	30	0.85
Cement	Shovel	10	754	......	....	0.42	74	0.15	26	0.57
Cement	Shovel	11	1203	......	....	0.39	74	0.14	26	0.53
Cement	Shovel	5	1650	......	....	0.44	76	0.14	24	0.58
Cement	Shovel	5	2275	......	....	0.35	80	0.09	20	0.44

TABLE 2.—REMOVING LOAM AND CLAY OVERBURDEN FROM 44 LIMESTONE QUARRIES, 1927

Method of removal of overburden	Daily production, tons	Overburden feet	Quarry face, feet	Length of haul	Average cost per cubic yard per 100-ft. haul	Percentage of total cost in overburden removal	Average cost per ton of stone uncovered
By hand and wheelbarrow	509	5.0	85	175	$0.24	3.0	$0.03
By hand and wagon	401	2.7	75	550	0.31	2.5	0.027
By hand and car (man power)	50	4.5	80	150	0.50	1.2	0.02
By hand and truck	313	12.0	48	915	0.096	3.8	0.036
By hand and car (mule power)	125	25.0	80	500	0.07	3.6	0.05
By hand and car (locomotive power)	652	12.5	44	4750	0.04	3.8	0.029
By scrapers and horse power	187	8.0	65	225	0.32	2.4	0.018
By scrapers and tractor power	310	7.0	60	650	0.102	2.3	0.02
By scrapers and wagon haul	1000	1.5	22	1320	0.06	2.1	0.025
By power shovel and wagon and truck haul	1222	2.5	50	650	0.14	3.7	0.019
By power shovel and truck haul	787	7.0	73	857	0.085	2.2	0.02
By power shovel and wagon haul	850	1.0	66	800	0.075	0.7	0.004
By power shovel and railway haul	1715	10.0	101	1270	0.06	5.2	0.026
By dragline and railway haul	715	3.0	22	2000	0.0075	....	0.004
By dragline only	987	15.0	25	2000	0.015	6.5	0.07
By hydraulic methods and sluices	1600	22.5	115	4000	0.092	1.1	0.006

TABLE 3.—DRILLING IN 44 LIMESTONE QUARRIES, 1927

Method of drilling	Average tons stone produced daily	Av. height quarry face	Av. depth holes	Av. diam. holes	Tons broken per drill per day Prim.	Tons broken per drill per day Sec.	Tons broken per ft. of hole (primary)	Tons broken per sq. in. of hole (primary)	Av. total stone cost	Av. cost per foot of hole	Average drilling cost per ton (primary)	Average drilling cost per ton (secondary)	Average total drilling cost	Per cent of total stone cost for drilling
With churn drills	1150	57	57	5.5	497	312	21.25	0.61	$0.726	$0.518	$0.0314	$0.0238	$0.0456	6.3
With piston drills	90	45	17	2.0	20	......	6.9	0.58	1.01	0.15	0.028	0.02	0.069	6.8
With hammer drills	267	51	15	1.4	119	109	4.35	0.49	1.27	0.11	0.01	....	0.073	5.7
With churn drills	260	400	32	3.5	87	......	13.8	0.64	0.40	....	....	....	....	....
	770	53	38	4.0	342	181	13.1	0.52	0.79	....	....	....	....	....
	1244	39	40	5.0	540	783	12.5	0.40	0.65	....	....	....	....	....
	1038	68	64	5.5	552	342	16.6	0.48	0.99	....	....	....	....	....
	1090	66	67	6.0	444	340	26.5	0.70	0.72	....	....	....	....	....
	867	130	135	8.0	867	284	29.8	0.59	0.35	....	....	....	....	....
With piston drills	90	45	17	1.9	20	......	6.9	0.58	1.01	....	....	....	....	....
With hammer drills	435	62	13.5	1.8	125	244	3.0	0.27	1.13	....	....	....	....	....
Gasoline churn drills	998	57	56	5.7	500	......	22.2	......	0.76	0.375	0.015	....	0.05	6.6
Air churn drills	1170	110	80	5.7	532	......	27.1	......	0.58	0.42	0.027	....	0.049	8.5
Electric churn drills	1063	68	70	5.3	488	......	24.9	......	0.67	0.32	0.017	....	0.037	5.5
Steam churn drills	700	40	42	6.0	700	......	34.0	......	0.35	0.22	0.0075	....	0.015	4.3
Coyote blasting	328	120	....	....	......	......	......	......	0.96	....	0.0133	0.0418	0.0551	5.7

TABLE 4.—BLASTING IN 63 LIMESTONE QUARRIES, 1927

Method of drilling	Av. tons stone produced daily	Av. diam. drill holes	Av. depth drill holes	Av. height quarry face	Tons stone per pound explosive Prim.	Sec.	Total	Blasting cost Prim.	Sec.	Total	Total av. stone cost per ton	Crusher size*	Percentage of total cost for blasting
With churn drills. Holes less than 25 ft.	1105	5.1	21	33	3.8	4.0	2.5	$0.05	$0.04	$0.05	$0.67	5L-1S	7.5
With piston and hammer drills. Holes less than 25 ft.	536	1.7	14	58	3.0	60.0	3.0	0.06	0.10	0.09	1.11	3L-11S	8.1
With churn drills. Holes 25 to 50 ft.	1280	5.6	41	44	4.7	55.4	2.6	0.06	0.03	0.08	0.70	11L-4S	11.4
With piston and hammer drills. Holes 25 to 50 ft.	500	2.3	28	25	....	......	....	......	......	0.07	1.35	....	5.2
With churn drills. Holes 50 to 100 ft.	1040	5.6	66	64	3.7	26.0	2.9	0.04	0.02	0.06	0.73	9L-5S	8.2
With churn drills. Holes 100 ft. and up	1490	6.3	151	148	4.1	13.2	3.0	0.04	0.03	0.05	0.54	4L-2S	9.3
With crushers larger than 24-in. opening	1265	5.2	57	66	3.6	28.4	2.6	0.05	0.03	0.08	0.65	L	12.3
With crushers smaller than 24-in. opening	630	4.0	39	53	4.0	30.3	3.6	0.05	0.03	0.08	0.98	S	8.2
With churn drills and larger than 24-in. opening	....	....	....	....	....	......	....	0.05	0.02	0.07	0.63	L	11.1
With churn drills and smaller than 24-in. opening	....	....	....	....	....	......	....	0.05	0.02	0.07	0.75	S	9.3
With piston and hammer drills and larger than 24-in. opening	....	....	....	....	....	......	....	0.06	0.03	0.09	0.79	L	11.4
With piston and hammer drills and smaller than 24-in. opening	....	....	....	....	....	......	....	0.06	0.03	0.09	1.20	S	7.5

*L=Over 24-in. opening; S=less than 24-in. opening.

TABLE 5—LOADING COSTS AT 54 LIMESTONE QUARRIES, 1927

Method	Face range, ft.	Average height of face, ft.	Av. daily ton-nage	Tons per cu. yd. of dipper capacity	Loading cost	Total cost	Per cent
Hand	0– 25	15	238	......	$0.34	$1.43	23.8
Hand	25– 50	38	257	......	0.27	1.20	22.5
Hand	50– 75	67	211	......	0.17	1.09	15.6
Hand	75–100	75	113	......	0.25	1.24	20.0
Hand	100–150	112	171	......	0.25	1.02	24.5
Hand	+150	288	175	......	0.10	0.90	11.1
Shovel	0– 25	17	770	291	0.092	0.79	11.6
Shovel	25– 50	36	842	332	0.082	0.76	10.8
Shovel	50– 75	52	2027	360	0.087	0.55	15.8
Shovel	75–100	75	1642	362	0.066	0.57	11.6
Shovel	100–150	106	1362	496	0.064	0.81	7.9
Shovel	+150	242	1345	419	0.085	0.69	12.3

final compilations can be started on that date and the resultant report be presented during the current year. To enable the bureau to do this, all operators are requested to send in completed questionnaires as early as possible.

Final tabulations will cover trap, granite, and sandstone in the same manner that limestone is treated in these preliminary tables.

TABLE 6.—LOADING COSTS AT 53 LIMESTONE QUARRIES, 1927

Method	Size range, tons	Av. daily tonnage	Load-ing cost	Total cost	Per cent
Hand	0– 100	58	$0.27	$1.33	20
Hand	100– 200	128	0.17	1.32	13
Hand	200– 300	219	0.22	1.05	21
Hand	300– 500	393	0.28	1.12	25
Hand	0– 500	212	0.23	1.20	19
Shovel	0– 500	192	0.08	1.00	8
Shovel	500–1000	766	0.09	0.74	12
Shovel	1000–2000	1267	0.08	0.58	14
Shovel	2000–up	3212	0.07	0.58	12
Shovel	0–up	1375	0.08	0.67	12

TABLE 7.—LOADING COSTS AT 26 LIMESTONE QUARRIES, 1927

Shovel, dipper size	Power	Type	Av. tons daily	Loading cost	Total cost	Per cent
¾ to 1 -yd.	Steam	Railway	545	$0.16	$1.00	16
¾ to 1 -yd.	Electric	Caterpillar	875	0.04	0.85	5
1¼ to 1¾-yd.	Steam	Caterpillar	700	0.10	0.35	29
1¼ 'o 1¾-yd.	Electric	Caterpillar	1157	0.07	0.55	13
2 to 2½-yd.	Steam	Railway	1425	0.12	0.69	17
2 to 2½-yd.	Steam	Caterpillar	1575	0.08	0.72	11
2 to 2½-yd.	Electric	Caterpillar	1800	0.05	0.47	11
3 to 3½ yd.	Steam	....	3327	0.05	0.54	9

TABLE 8.—POWER SHOVEL DUTY AT 41 LIMESTONE QUARRIES, 1927

Shovel	Type	Shovel duty, tons loaded daily per cu. yd. of dipper capacity
Steam	Railway	290
Steam	Traction	306
Steam	Caterpillar	324
Electric	Railway	368
Electric	Caterpillar	476

TABLE 13.—DRYING COSTS AT 9 LIMESTONE QUARRIES WITH ROTARY KILNS, 1927

Average tons daily	Kilns	Tons per kiln daily	Drying cost per ton	Total stone cost	Per cent
1362	24	510	$0.07	$0.76	9.2

TABLE 9.—TRANSPORTATION AT 84 LIMESTONE QUARRIES, 1927

Hauling method	Loading method	Av. tons daily	Shovel duty*	Av. loco-motive weight	Locomotive ton duty†	Av. car capacity	Car ton duty‡	Loading cost	Hauling cost	Total cost	Per cent for hauling
Hand and car	Hand	130	......	......	......	1.5	6.1	$0.29	$0.11	$1.21	9.1
Animal and wagon	Hand	202	......	......	......	......	......	0.14	0.08	0.93	8.6
Auto truck	Hand	145	......	......	......	......	......	0.08	0.18	1.50	12.0
Auto truck	Shovel	105	47	......	......	5.0	4.2	0.05	0.05	1.45	3.5
Gravity plane	Hand	142	......	......	......	1.8	2.8	0.28	0.13	1.18	11.0
Gravity plane and locomotive	Shovel	558	227	14.0	14.7	4.4	6.8	0.18	0.10	0.88	11.4
Hoist and locomotive	Shovel	1857	426	8.0	61.0	9.0	2.7	0.05	0.06	0.63	9.5
Central electric	Shovel	864	405	......	......	12.0	16.4	0.06	0.02	0.41	4.9
Gasoline locomotive	Hand	260	......	6.0	33.0	3.0	3.4	0.30	0.17	1.39	12.2
Gasoline locomotive	Shovel	911	385	10.0	35.0	5.3	9.7	0.07	0.04	0.63	6.3
Electric locomotive	Shovel	664	539	8.5	29.0	5.5	4.8	0.08	0.07	0.87	8.0
Steam locomotive	Shovel	1320	376	25.0	92.0	7.0	6.7	0.09	0.08	0.61	13.1

*Shovel duty: Tons loaded per cubic yard dipper capacity. †Locomotive ton duty: Tons hauled per ton of locomotive weight. ‡Car ton duty: Tons hauled per ton of car capacity.

TABLE 10.—CRUSHING COSTS AT 35 LIMESTONE QUARRIES, 1927

Crushing method: Primary Type	Size*	Secondary Type	Product for†	Loading method	Av. daily tonnage	Dipper capacity, cu. yd. av.	Car capacity, tons	Crushing cost: Primary	Secondary	Total	Total stone cost	Per cent for crushing
Jaw	S	None	Lime	Hand	300	......	1.2	$0.25	......	$0.25	$1.13	22.0
Jaw	L	None	Lime	Shovel	987	1	3.6	0.05	......	0.05	1.07	4.7
Jaw	S	Gyratory	Lime and C. S.	Hand	157	......	1.3	0.05	$0.08	0.12	1.23	9.8
Jaw	L	None	Lime and C. S.	Shovel	944	2¾	11.0	0.04	......	0.04	0.64	6.2
Jaw	S	Jaw and gyratory and hammer mill	C. S.	Hand	219	......	2.0	0.07	0.04	0.11	1.87	5.9
Jaw	L		C.	Shovel	1217	2¼	11.5	0.04	......	0.09	0.50	18.0
		Gyratory or hammer mill (from group next above)							0.07 0.04			
Gyratory	S	Gyratory	Lime and C. S.	Hand	100	......	......	0.10	0.10	0.20	0.81	24.7
Gyratory	L	Gyratory	Lime and C. S.	Shovel	105	1	......	0.03	0.05	0.08	1.45	5.5
Gyratory	S-L	Gyratory	C. S.	Hand	375	......	1.8	0.13	0.03	0.16	0.99	16.1
Gyratory	S-L	Gyratory	C. S.	Shovel	800	2	5.0	0.08	0.06	0.14	0.87	16.1
Gyratory	S-L		C.	Shovel	1000	2½	6.5	0.04	......	0.06	0.69	8.7
		Gyratory or hammer mill (from group next above)							0.02 0.03			
Rolls	S	None	C. S.	Shovel	818	......	2.4	0.22	......	0.22	0.92	2.4
Rolls	L	Rolls	C.	Shovel	1720	2	9.0	0.01	0.01	0.03	0.43	7.0
Hammer mill	L	None	C.	Shovel	600	1¾	7.5	0.06	......	0.06	0.47	12.8

*S=less than 24 in.; L=over 24 in. †C. S.=crushed stone; C=cement.

TABLE 11.—CRUSHING COSTS AT 28 LIMESTONE QUARRIES, 1927

	Primary	Secondary	Total
Primary jaw crushers followed by gyratory	$0.06	$0.06	$0.12
Primary jaw crushers followed by hammer mill	0.06	0.04	0.10
Primary gyratory crushers followed by gyratory	0.07	0.04	0.11
Primary gyratory crushers followed by hammer mill	0.07	0.03	0.10

TABLE 12.—STORAGE COSTS AT 11 LIMESTONE QUARRIES, 1927

Average tons daily	Cost into storage	Cost out of storage	Total	Total stone cost
991	$0.067	$0.094	$0.172	$0.83

TABLE 14.—SCREENING, ELEVATING AND CONVEYING COSTS AT 10 LIMESTONE QUARRIES, 1927

Method	Average tons daily	Sizing screens	Fine screens	Screening cost	Screening, elevating, conveying cost	Total stone cost	Per cent	Tons per man-hour
Grizzly scalper	507	Trommel and shaking	Vibrating	....	$0.116	$1.16	10	5.8
Trommel scalper	600	Trommel and shaking	Vibrating	$0.12	0.133	1.12	12	7.3
No scalper	632	Trommel	Vibrating	0.05	0.066	0.85	8	10.1
Sizing:								
With shaking screen	522	....	Vibrating	....	0.22	1.12	20	5.5
With trommel screen	394	....	Vibrating	0.05	0.064	0.93	7	5.5
With vibrating screen	1388	....	....	0.005	0.03	0.82	4	20.1

National Slate Association Perfects New Organization

ONE RESULT of the January annual meeting of the National Slate Association was the perfection of an organization which will co-ordinate the activities of all branches of the industry.

Due to the increase in membership during the past year, the association now covers practically the entire industry, co-ordinating the several sectional associations and selling companies of producers and marketing companies. With the new arrangement all members of the Bangor Slate Association and the Pennsylvania Blue Grey Roofing Slate Association, and Vermont Unfading and Weathering Green companies, automatically become members of the National Slate Association. The Portland Monson Slate Co., of Maine, and several of the distributor companies have become members. The Roofing Contractors' Division has nearly doubled its membership over 1927.

Now with the complete tie-up between producer, distributor, roofing and setting contractor, the national association should be able to carry on extensive co-operative advertising and to practically eliminate unfair practices. And with a complete organized industry, it should be able to work in harmony on all problems and to create a greater demand for slate in all of its uses—uses that are now encouraged by the new building regulations requiring fireproof construction, and by a natural public approval swinging back to slate. For 1929 and for all succeeding years, great accomplishments are anticipated.

The results of the election of officers and directors were: William H. Smith, of the north Bangor Slate Co., president; W. A. LeSueur, of the LeSueur-Richmond Slate Corp., vice-president; Elwood S. Doney, of the Doney Slate Co., treasurer; and W. S. Hays, secretary. F. C. Sheldon, the retiring president, and Hugh G. Williams, of Hugh G. Williams Slate Co., were added to the board of directors. The latter now has a quarry in Georgia as well as several near Granville, N. Y. Daniel McKenzie, of Brooklyn, was admitted to contributing distributor membership, as he now owns and operates the Roofers Material Corp. He was added to the board of directors to represent the distributors, assisting William Moore, of Philadelphia, who has been a valuable member and hard worker for the association and the cause of slate.

Officers of the Roofing Contractors Division were elected as follows: Chairman, William Garthe, Baltimore, Md.; vice-chairman, Albert J. Wagner, Chicago, Ill.; secretary, Albert S. Kleckner, Reading, Penn.; executive committee chairman, H. A. Daniel, Newburgh, N.Y.; regional chairmen, Charles E. Leyden, Lancaster, Penn., Middle Atlantic; C. P. Tanner, Henderson, N. C., Southern; C. I. George, Cleveland, Ohio, Central; Clarence C. Brennan, St. Louis, Mo., Midwestern; N. M. Cashman, San Francisco, Calif., Western; T. A. Irwin, Hamilton, Ont., Canada; Charles A. MacNutt, Montreal, Que., Canada; H. F. Kothmann, New Orleans, La., Southern-Central; C. A. Hickman, Brockton, Mass., New England.

The specific problems which the roofers laid before the producers were:

1. That all producers and distributors issue only gross price lists.
2. That trade discounts be allowed to approved roofing contractors.
3. That definite co-operation for local advertising and sales promotion work with roofing contractors be developed by each district association and selling company and individual producing and marketing companies.

There was a joint meeting of producers with Committee D-16 of the American Society for Testing Materials, at which there was frank discussion of common problems between slate producers and the manufacturers of equipment and supplies used in milling and quarrying of slate. Even sand for rubbing beds and wire saws can be carefully selected and used again and again when properly taken care of, as was pointed out by the Drinker Sand Co. and the Pennsylvania Glass Sand Co. The Universal Nozzle Co. made the producers think about hydraulic stripping of quarries.

Tennessee Mineral Products May Take Part in Merger

IN A LETTER to stockholders of Iron Cap Copper Co., which company owns two-thirds of the entire capital stock of Mineral Products Co., which in turn owns all the stock of Tennessee Mineral Products Co., a producer of feldspar, it is stated negotiations are now in progress looking to a consolidation of the properties of the Tennessee Mineral Products Co. with several other concerns.

The officers of the Mineral Products Co. have, with the approval of the board of directors, entered into an agreement for the disposal of the company's interest in the Tennessee Mineral Products Co., either by sale or by consolidation. Under the agreement it is contemplated to create a new company to take over the property of the Tennessee company, having a capitalization of $600,000 par value of 7% first preferred stock, $250,000 par value of 7% second preferred and 25,000 shares of no par common stock. Both classes of preferred are to be cumulative as soon as net profits available for dividends and after depreciation, for 12 consecutive months, reach a stated amount.

Under the sale contract the purchaser agrees to buy the $250,000 of second preferred and $50,000 of the first preferred stock and all of the common for $300,000 cash and the balance of $550,000 of the first preferred at par plus accumulated and accrued dividends at the rate of $150,000 a year.

In the event of consolidation, the Mineral Products Co. under the contract retains the option of participating therein, in which case Mineral Products Co. would retain the $300,000 in cash and have the option to receive back the $550,000 of first preferred stock, returning whatever money had been paid over and above the $300,000, or to retain the money and permit the purchaser to retain the stock to the extent paid for and receive an appropriate amount of common stock.

The cash received under either of the two arrangements is intended to be used, so far as needed, in aiding proper development and construction work at the Christmas Copper Co. property, which is located at Christmas, Ariz., and is owned about three-fourths by the Mineral Products Co. At the Christmas mine construction of a concentrator having an initial capacity of 400 tons per day has been started.—*Wall Street News* (New York City).

Association of Australian Cement Manufacturers

THE PRINCIPAL AUSTRALIAN CEMENT manufacturing companies, representing a combined capital of approximately £7,000,000 sterling, have formed a co-operative company entitled the Australian Cement Manufacturers Association, with the object of extending and improving the uses of cement concrete. The companies concerned comprise the Commonwealth Portland Cement Co., Australian Cement Co., Sulphide Corporation, David Mitchell Estate, National Portland Cement Co., Kandos Cement Co., South Australian Portland Cement Co., Adelaide Cement Co. and Tasmanian Cement Co.

The new association will not engage in selling the product, but is formed solely for the purpose of propaganda and of educating the public on the uses of cement. A research laboratory will be established to assist the economical development of natural resources, such as sands, gravels and stone, for concrete making purposes.

Putting Action Into Telephone Directory Ads

Aggregate Producers Should Include Enough Latent Energy to Match "Do-It-Now" Sentiment of Customers

By Willis Parker
Denver, Colo.

THE mineral aggregate company which considers using, in addition to a mere listing, a display advertisement in the classified section of the telephone directory, will find it advantageous to include action elements in the ad. Unlike many forms of publicity, the directory ad may remain dormant for many weeks. Only when a person desiring the product or service looks into the classified section to choose a firm to patronize, does the advertisement have an opportunity to present its message. Hence there must be enough latent energy, action held in abeyance, confined within the space to cause the message to spring out when a prospective customer opens to the page on which it is printed.

The customer generally is motivated by an action element himself. As a rule he is in a hurry, so the directory advertisement must reflect similar hurriedness and demonstrate similar speed in presenting the offer of quick service, accepting the obligation and concluding the transaction. In other words the action element in the advertisement should match the action elements in the customer.

Three Sample Advertisements

Before enumerating the various ways by which the action element may be included in the ad, we shall consider the ads of a few firms picked at random from telephone directores.

Two action elements are included in the advertisement of the Arizona Sand and Rock Co., of Phoenix, Ariz. The first and more prominent and obvious, is the sketch showing a pile of sand and a pile of crushed stone just inside a board fence, on which is tacked a placard containing the company slogan "One Yard Or a Thousand."

This picture harmonizes with a picture in the customer's mind. He sees a pile of sand, or a pile of crushed stone, at the point he desires it—on the job, or at his home. Since the two pictures harmonize, the action element which motivated the customer to seek the service is matched and we may well suppose that, the harmony being present, he will follow through and select the telephone number which is presented in white letters and figures on a black panel which seems to be set up in the pile of sand.

The second action element is contained in the lettering. In large hand-designed letters across the top of the advertisement and above the aforementioned picture of sand piles are the words, "rock sand." They seem to be balanced on the top edge of the fence and that in itself means action.

Down below the sand pile and the telephone number is the sentence, "Play Ground Sand—Driveway Gravel." The lettering in

A telephone directory advertisement with "action" copy

this instance is a sort of script or italic. It is not printed from type but was hand-lettered into the entire design. Script is full of action. We sub-consciously associate it with a hand, containing pen or pencil, moving across a page. Italic type has similar properties because it is somewhat like script, and the letters slant from left to right, which is an indication of movement, or action.

The Apex Sand and Gravel Co., of Denver, Colo., puts a small picture of a workman shovelling sand into a truck. This action element has the same influence upon the prospective customer as does the picture of the sand piles in the ad of the Arizona Sand and Rock Co. There is a bit more action, however, as it is contained in the indicated movements of the workman.

The firm name is presented in a curve over the top of the space—another action element. The phone number is prominently presented in a circle in the lower right hand corner of the space. Above the circle and yet apparently attached to it, are flowing scrolls, one of which contains the word "Phone" and the other "Night or Day." The flowing appearance of these scrolls indicates action.

"Lightning Service" is the slogan of the J. W. Brannan Sand and Gravel Co., Denver. While the slogan is not presented in as large lettering as other words in the ad, it is in italics and from both ends of the slogan are jagged lines indicating lightning flashes. Three action elements are thus tied up in the slogan. The first is the italic lettering. The second is the word "lightning" and the third is the representation of lightning flashes.

For the assistance of others of the industry who may desire to incorporate more action in their advertisements, we list below some of the methods uncovered by a survey of telephone directory advertising:

(1) Using pictures illustrating, (*A*) piles of the material; (*B*) material being loaded or unloaded; (*C*) material being used.

(2) Giving words such as "rush" and its synonyms the appearance of flying through space. The effect is obtained by placing the letters slantwise and running horizontal lines through them and toward the rear.

(3) Using arrows to point out or to combine important features of the advertisement. A straight arrow contains some action; a straight arrow apparently in flight contains more action; a curved arrow contains more action.

(4) Using illustrations of animate or inanimate objects in action; preferably something associated with the business.

(5) Presenting some of the lettering and words along gentle curves instead of along straight horizontal lines; a curve usually contains more action than a straight line.

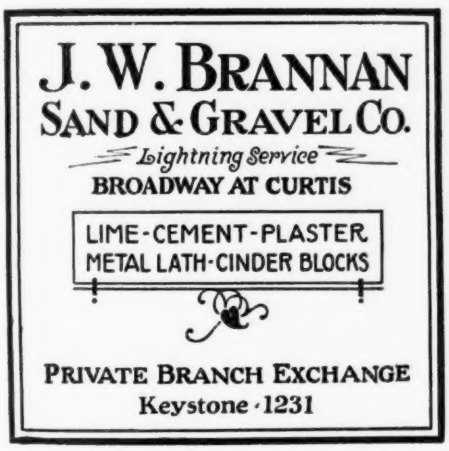
(6) Using some script or italic lettering in the ad.

(7) Illustrating the telephone number by the picture of a telephone, or a picture of a telephone and two hands, one of which

Telephone directory advertisement with several good features

is about to life the receiver from the hook.

(8) Using action designs, such as a rising sun with rays extending in all directions; or by cubistic patterns along the lines of a



Sample telephone directory advertisement

crazy quilt in which portions of the message are placed; or by suggestions of lightning flashes.

Depletion of Deposits and Income Tax

DEPLETION is the whole or partial exhaustion of a deposit, and it is not to be confused with depreciation, which is loss on plant and equipment through wear and obsolescence, according to an article in a recent issue of *National Sand and Gravel Bulletin*, by H. R. Stutsman and Elmer T. Cummins, income tax council and consulting engineer.

The ordinary method of figuring depletion is to divide the cost of the property by the number of units (tons or yards) it contains. This gives a unit cost for depletion which must be added to operating cost, sales expense and depreciation to find the true cost per ton. If the number of tons or yards is found, as the work proceeds, to be greater or less than the original estimate, depletion should be figured by dividing the number of units remaining into the balance of the cost that has not already been charged off. The depletion for subsequent years will therefore be greater or less than it was by the original estimate, according to whether a greater or less tonnage was found to be correct.

The federal income tax law recognizes that depletion is an allowable deduction from income, and according to the article there are three separate bases allowed for determining the amount of depletion, which are:

"1. Any property or deposit owned prior to and on March 1, 1913, may be depleted on the basis of the fair market value of the property or deposit on that date.

"2. Any property or deposit acquired after March 1, 1913, the basis of depletion deductions shall be the cost of the property or deposit.

"3. Any property acquired either prior or subsequent to March 1, 1913, and not purchased as a proven commercial deposit, and where, through development and exploitation after March 1, 1913, a discovery of a commercial deposit is made that was not previously known to exist, and where the fair market value of the property becomes disproportionate to its cost on account of the discovery, the basis of depletion deductions for 1918 and subsequent years shall be the value of the property or deposit at or within 30 days of the discovery. (Depletion deductions on discovery not allowable prior to 1918 on account of the fact that under prior tax laws no discovery provisions were made.)"

Discussing these, the article says that it is very difficult to arrive at the value of a property as of March 1, 1913, especially where the estimate is made some years later. Any value so claimed by a taxpayer is subject to review by the Commissioner of Internal Revenue and such evidence as cost, actual sales and rentals and valuation for taxation purposes will be taken into account. Estimates of recoverable reserves as of March 1, 1913, may be made from past production and recovery, actual subsequent production, results of drilling, testing and examination, etc. Where no estimates were made as of March 1, 1913, it is allowable to use actual subsequent production plus whatever reserves are estimated to be in the property when the estimate is made.

For any deposit acquired after March 1, 1913, where the basis of depletion is the cost, the income tax regulations, which are quoted in the article, provide that the cost must be shown to have resulted from a bona fide sale representing the actual market value of the property.

The rules permitting depletions based on discovery, the article points out, are very stringent. The general facts necessary to establish a right to discovery valuation are that the property in question be acquired without the actual knowledge that the mineral sought resides therein and that after discovery is made by development and exploitation the value of the property becomes entirely disproportionate to its cost. No discovery will be allowed where the property is proven and known to contain the mineral sought even though it is purchased for a nominal sum.

Leaseholds can be valued the same as free property for depletion deductions but the Bureau of Internal Revenue has held that deductions for depletion are allowable only for 1918, the year the law controlling this was passed, and subsequent years. However, a decision of the United States Board of Tax Appeals, which is quoted in the original article, would tend to show that depletion allowances may be made for 1916 and 1917 as well.

Olympic Portland Shoots Large Farewell Blast at Its Balfour Quarry

IN a farewell blast at its Balfour quarry, the Olympic Portland Cement Co., of Bellingham, Wash., brought down 50,000 tons of rock with seven tons of explosives. After this rock is used up the company will start its quarry operation at its new location across the valley. The blast was a success in every way, officials of the company stated, bringing down considerably more rock than they had hoped for, but unfortunately it also did more damage to the crusher building than had been anticipated. It was expected that some of the rock would reach the crusher building, but it actually came near demolishing the west wall of the building. However, none of the machinery, conveyors or other equipment in the building was wrecked. A photographer who stayed at what he thought was a safe distance narrowly escaped death when a 100-ton rock hurtled through the air a distance of 1800 ft. and came down only a short distance from him, digging a hole in the ground 55 ft. long and 20 ft. deep. There was a considerable crowd at the quarry, but they remained at a safe distance.

The blast was carefully laid by boring a tunnel back many feet into the rock wall of the mountainside above the Balfour mill. The first drift from this tunnel contained 38 boxes of 60% powder. Back a few feet was another pair of drifts, at the end of the north one, 30 boxes of 40% and 35 boxes of 60% were placed. At the other extremity, 28 boxes of 40%, and 40 boxes of 60% were buried. The tunnel went back another space and two more opposite drifts were driven. At the end of the north hole 60 boxes of 40% were put and at the end of the other, 44 boxes of 40% were placed.—*Bellingham* (Wash.) *Morning Herald.*

Depletion and Depreciation Problems in Federal Taxation

Failure to Employ Technical as Well as Legal and Accounting Advice Has Proved Costly in Numerous Instances

By William Henry Harrison
Consulting Engineer, Washington, D. C.

AT THIS TIME the effect of the depletion and depreciation allowances on income reported under the federal acts covering taxation is as much a subject of interest to the rock products industries as it has ever been in the past. This interest lies in the effect of the existing statutes as they apply to the corporation, partnership or individual income tax returns that still remain open for the prior years. In spite of the fact that the great majority of the income tax returns for the former years have been closed, new problems or technicalities still arise in specific cases. These develop in the most unexpected quarters and raise questions as to what further extremes in the future tax laws will be reached from the standpoint of technicalities and benefits under the legislation of the future.

The subject is so extensive and so ramified with varied results in all of its phases, and conflicting desires between industries so extensive in legislation and administration that it is not an easy subject to cover completely in any prepared paper. It is perhaps in part the reason why those practitioners, who have to deal with the problems of depletion and depreciation under the federal acts covering taxation have been slow in discussing the technicalities and effects of the legal allowances for depletion and depreciation. It is a large subject, and one which this paper makes no pretense to cover in full. In fact no matter how honest the effort or good the intentions of the analyst, who starts out to give a full exposition of the effects of the federal acts covering taxation in so far as depletion and depreciation is concerned he will fall short of his goal. This merely shows that the subject is one, which is so involved, so complex, and so many sided that it cannot be hemmed up for a full inspection or discussion. The best that the average writer can do is to take a sector, and marshal his facts into the front lines, and bring up his reserves in the form of Decisions, Regulations, and Opinions. His experience gained across the conference table, or in the atmosphere of court practice enables him to intelligently dicuss the issues.

It is believed that such a discussion bears some resemblance to a skirmish line, which is sent forward to feel out the situation. The open space in that line may leave an opportunity for concentrated attack by some shrewd student of the subject, who misconstrues the good intentions of the writer, and the manifest impossibility of closing up all the gaps in any short article.

It is perhaps something of this physchology, which prevails in the minds of the average writer that creates a reluctant attitude in taking up the discussion of federal taxes in the columns of the business press. It explains the obvious necessity for the tempered or at least the restricted discussion of the subjects considered in any paper.

Technical as Well as Legal and Accounting Problems

Again, the technical engineering subjects in question are all too frequently left to the taxpayer's counsel, and accountants, who are frequently untried, or unacquainted with the mass of engineering work and labor that has come down through the years, since the inception of the federal tax legislation.

The public, and I speak of that portion of the taxpayers, who have few contacts with tax matters are inclined to believe that whatever problems may be involved the members of their staff, their counsel tried in common law cases only, their accountants tried in commercial practice, and even their own engineers tried in production problems can evolve the solution to complicated questions involving the statues governing income tax practice.

Tax questions in engineering matters are complex to say the least. The full potential benefits are frequently sacrificed by inadequate knowledge of what has already been a matter of record.

Where ever an important decision has been made in the government's tax procedure, involving engineering, or overlapping legal questions associated therewith, and calling for interpretative study, it may be accepted as a fact that the engineering problem has previously been analyzed by its engineer, who is a specialist by years of tried and proven experience. The alternative parts applying to a specific situation and calling for a legal interpretation have been set forth by the engineer. It then remains for the government counsel to determine the legality of the commission based on the facts set forth in the government engineer's findings or outline, as to the technical features, and the statutory sections of the law that have been applied.

The more germane features of the engineer's work in federal taxation, such as the selection of factors in finding valuation results are not always simple. Frequently the thoroughness with which this is done is the difference between an orderly presentation of the facts as of a basic date, and the hazardous method of running far ahead of the basic date to select conditions for a pior date. A historical study of all the conditions before and after a basic date, and tying the threads of a previous, but pertinent condition to developments as of the basic date, and measuring the full effect of these same conditions in after years is an example of effective engineering work.

Blunders in Presentation of Technical Data

Invariably, one practice among many that is questionable, and the one most easily adopted by a great many laymen, counselors, and accountants is to take new or remote conditions, facilities and results, subsequent to the basic date, and set-up the basis for a defense of the claim thereon. This is the natural result of inexperience, and the lack of familiarity with the engineering and statutory requirements of the situation, which makes certain that their time and labor has been wasted.

The burden of this discussion is to show that the administration of federal taxation falls into three main divisions of effort. These are legal, accounting, and engineering. The vast majority of income tax cases are strictly accounting cases, and require no legal or engineering attention.

If the file of the cases of the average attorney, who is representing the taxpayers is examined, it will be found that the accounting questions outnumber these with strictly legal questions. It is as one substantial legal representative has stated to the writer: "I do not see why so many tax cases are brought to me, because I find that all that is needed is an accountant, who understands accounting and an engineer who understands his problems as applied to federal taxation."

However, it is noted that a very few representatives of taxpayers are equipped in all three requirements of practice, and some others in only two, so that the third angle, usually engineering, may be referred back to the taxpayer for specialized attention. The obligation falls on the taxpayer to add additional technical service and cost to guard this flank of his efforts to sustain his appeal. This is a situation such that the lack of safeguards in utilizing the specialist's knowledge explains the poorly prepared appeal, or protest.

The ideal condition for clarity and effectiveness in sustaining the contentions presented in a brief is to adopt the same policies that the administrators of the law employ, which are to submit their cases to the accountants for solution of accounting questions, and the attorneys for legal questions, and the engineers for engineering questions. A combination of these is available, but there are not many such combined services. More often than not in private practice it is the attorney who is called on to shoulder the accounting and engineering problems. This is the root of unfavorable decisions involving engineering and accounting questions. Whether or not this is contrary to the rules of practice as laid down by the American Bar Association, I do not know, but it is very certain that the average attorney goes far afield in the pursuit of his profession. It would appear that he had taken on several professions instead of the one for which he was presumably trained. At the same time he does not hold membership in any accounting or engineering society.

Specific Examples of Blundering

Let us note for a moment what happens in the case of a taxpayer, who has only accounting or engineering questions involved in his tax case, which has been turned over to his attorney. The latter's first step, after an examination of the facts, will be to make out a blanket protest, appeal, or claim as the case may be before the department for the years involved. This action either holds-up, initiates, or starts the new or added consideration, which it will receive. This blanket statement contains no summarized or definite findings of fact. It merely stays, or initiates an action pending the filing of the statement of facts. The taxpayer's accountant must then gather and prepare the facts necessary to fill in the omissions in the blanket statement falling in the categories named. It merely means that practically the entire labor falls back on the taxpayer. He could write and file the protest, appeal, or abatement equally as well, because it requires no legal phraseology, and the regulations definitely emphasize this point. In short the taxpayer in such cases has all the work to do, but a major part of the benefits of his labor go to his attorney, who has merely drafted a blanket claim and sat in a conference for a few hours. Many cases it is believed ultimately fall into this class, and involve no legal questions. The taxpayer must argue his own statement of facts, because he alone knows what they are, and to what they apply.

As an illustration of some of the difficulties, which incompetency will create, it might well be asked why is a compromise necessary if the statutory benefits under the law are clear, concise and specific? No matter how arbitrary a conclusion may be the statutory requirements remain, and after all the smoke has cleared away as a result of the pro and con discussions the statutes are in the same place at the end as at the beginning.

The substance of all this is that if the accountant, attorney or engineer is in full possession of the facts as to his client's rights, and knows the statutory benefits surrounding these rights he has absolutely no grounds for their surrender in a compromise. They are as fixed, and unchangeable as the statute itself. The explanation for the prevalence of compromises appear to be that the taxpayer's attorney, accountant or engineer (more often the first two than the last) are not sure of their facts, the statute, amendments and interpretations thereof, which guards the rights in question.

However, there are still other associated factors. The contingent fee that carries no retainer has contributed to the surrender of the taxpayer's rights. Matters that have been pending for years under a contingent fee control grow weary with the passage of long periods of time. The attorney or accountant wants his money for services rendered. His connection with the taxpayer will cease perhaps when the matters involved are cleaned up. Therefore, they may and are sometimes actuated by self-interest to give up, and like the man who has gone overboard in a heavy sea, after long hours of struggle with the waves gives up the fight. But unlike the latter he has lost nothing. The loss belongs to his client.

Know You're Right—and Go Ahead

If the facts and the statutes are in agreement, and the tried and proven experience knows where they meet, then the prudent and reasonable answer is to hold to the even and direct course, and if necessary to carry the force of that conviction into the courts for adjudication.

It is noticeable that there is more than one reason for surrender in a compromise. By and large the one cited above is a controlling factor. Especially if the contingent fee carries with it no retainer.

Timidity, ignorance, and insufficient knowledge of the facts involved through the entrance of other professional problems, and for which no specialized aid has been provided is strongly evidenced by the record of tax matters decided in the board of tax appeals and the courts.

Examples of Specific Cases

To illustrate the importance of specialized aid, and more particularly the preponderance of engineering cases that are lost before the courts and the board of tax appeals a few abstracts and citations are given of authentic opinions that have been handed down. The names of these cases are not listed, but they are a matter of public record, and each decision cited is from the public records of these cases. Manifestly it is not possible to hold up individual cases for criticism, or errors. Therefore the titles are blanked, but the citations are public information.

In the case of the U. S. v. X. Y. Z., which was tried in the United States district court there was involved among other questions the engineering valuation of a mining company of national prominence as of the basic date, which was March 1, 1913, and the profit or loss resulting from a sale several years later. Very little development work had been done up to the basic date.

The taxpayer's engineers were prominent and able men, tried and tested in the direct production problems of their profession. However, they were not accustomed to the atmosphere of the court. They apparently were not acquainted with the rules of evidence, or the importance of an opinion clearly and concisely founded on logical and acceptable facts.

There was a divergence of viewpoints as brought out on cross-examination of these witnesses. Their conclusions were different, as were their values. They showed that the events as of a subsequent date had intruded sharply into their opinions as of the basic date in arriving at their value at the basic date. Their opinions were not premised, or enclosed by current facts as of the basic date. There was no step-by-step sequence in events or conditions as of the basic date to aid in the presentation of their case.

Involuntarily it seems their eyes were constantly directed to the events remote to the basic date, and more nearly akin to the conditions as of the date of sale.

There is no evidence cited as to the historical events in support of their claimed March 1, 1913, value, nor is there a construction of the contentions as to the values claimed as indicated by plans in process or completion on any part of the property in question to support the values claimed as of the basic date.

Now, to come to the conflicts of all such cases. The petitioner's engineers, some eight in number, who as production or operating engineers could appreciate their problems, in the court room, and untried in the problems of federal taxation, they gave testimony in support of values of the mining property that ran all the way from $2,500,000 to $10,000,000. The sale price about 1918 was approximately the first named figure.

The court said if in fact the values claimed by the petitioner's witnesses at March 1, 1913, was a fact there was no question but what the property would have been sold then, instead of about five years later. The court even went further, and enunciated a principal set forth earlier in this paper. It

said: "Whatever may have been the intrinsic value of these claims, their market values as of March 1, 1913, is inextricably interwoven with conditions as they then existed."

Contrasting this feature of the taxpayer's testimony in its opinion with that testimony given by the government's engineer, the court said it found favor with the government engineer's testimony because from every angle it tied in with a reasonable conclusion as to the value claimed at the basic date.

In other words the care and study, which the government's engineer had given to the case proved again the benefits of specialized study, and experience. The government may have been out-numbered by eight engineers to one, but one engineer was enough to win the case, because he had his facts and opinions anchored to a proven record.

In the case of Silica v. the Commissioner of Internal Revenue, which happens not to be the true title, the United States board of tax appeals had among other questions the March 1, 1913, value of the petitioner's silica deposits to decide. In this case there does not appear to have been any engineering witnesses used by the petitioner's attorney in support of the values claimed, a situation that accounts for a high mortality list among the cases possessing engineering features that are presented to the board. In the instant case the values claimed at March 1, 1913, by the petitioner's attorney, ran from $120,000 to $2,000,000. The board asked for a reconciliation of these values, knowing that by the very exigencies of the situation there could only be one true and correct value. The petitioner's counsel said that these differences in value were due to inadvertence or typographical errors.

The board said: "The petitioner's explanation was not at all convincing. The valuation proposed by the petitioner does not satisfy the test of sound judgment." The case was lost entirely on this kind of testimony.

Valuation of Intangibles

In the case of W. E. S. v. Commissioner of Internal Revenue, the United States board of tax appeals had to decide the question of the valuation of some contracts acquired for stock. The petitioner was as usual represented by his attorney, presumably from its home town. The petitioner's attorney did not present any witnesses, either engineering or otherwise, which could support its claimed value, or any other value. According to the written opinion of the board member, which appears in the record, only some balance sheets showing that the company was prosperous was introduced by the petitioner's attorney. Apparently no other facts were presented. There were no engineering or audit witnesses to prove that these contracts had a value, and that the value was so much. A favorable decision can not be expected where the situation is only partially stated, and absolutely no evidence or proof of claimed values is put into the record. As near as one can determine from the record the counsel for the petitioner had all the facts that would permit the determination of the value of the contracts. But he could not put them together in order to sustain the petitioner's claim for a value of these contracts. The petitioner had no engineering or other witnesses, who could aid its attorney in submitting full and complete evidence. The case it is needless to say was lost.

In the case of V. X. v. Commissioner of Internal Revenue, which was tried before the United States board of tax appeals the petitioner was again represented by counsel. The question involved was the discovery value of gravel deposits.

The petitioner had no engineers or geologists representing it. The question involved was entirely an engineering question. The property appears to have lain on two separate hills, between which there intervened a valley. The main or old operations had been conducted on one of these hills, and received a value at March 1, 1913, which was not contested. Later a discovery value was claimed for a similar deposit found on the opposite hill as a result of development work several years after March 1, 1913.

The petitioner's attorney introduced no evidence, or competent witnesses to show what he in fact claimed, was a separate showing, a new discovery, and having no relation to the old workings. He was in fact in the position of making a claim, but did not cite any acceptable evidence by way of geological opinion that was fully cognizant of the true and actual conditions, and in doing so left his claim suspended in the air. The reader can easily forcast the ultimate result. The claim was disallowed for lack of competent evidence. (It is pertinent testimony, which the rules of good evidence require, and which the counsel is supposed to supply when he takes the case.)

Summary

The writer has made a broad review of the technical cases tried before the United States board of tax appeals and is struck by the strange lack of testimony by specialized and competent witnesses, who understand the requirements of the rules of evidence. The majority of such appeals are lost, because of this deficiency. In the courts the same situation applies, but there is sometimes a situation in which the presiding officer is not acquainted with the technical phases of the case, and his opinion is more likely to be a friendly one, than one based on a good interpretation of technical details. Before the United States board of tax appeals there is no such situation. The merits, and evidence are weighed carefully, and wisely. It remains the duty of the petitioners in all these cases to supply evidence that clearly, and concisely establishes their claim. Its first obligation is to see that its attorney does not neglect the rules of good evidence, and that these rules shall incorporate some of the good practices of the government counsel. These include competent engineering, and accounting witnesses. It would be much better to ignore legal advice if it is not competent advice, and depend on good accounting service to guide the destinies of its case until such time as the attorney's assistance is needed before the board or the courts.

Clearwater Lime Products Co. Completing Idaho Plant

THE Clearwater Lime Products Co., has been incorporated at Lewiston, Idaho, and it is expected that the company will begin operating its new plant at Orofino, Idaho, this month. The company will produce a variety of products from its lime deposits east of Orofino, and it is the intention to ship most of these to the Pacific Coast to be used in many different types of manufacturing there.

The company is rushing the work on the new plant and has already completed an overhead tramway 1200 ft. long which will bring the rock from the quarry to the crusher. The buckets on the tramway will carry 1000 lb. of rock each and are operated by the gravity system, the loaded buckets dropping down to the plant and raising the empty ones at the same time. The bucket speed is between 300 and 400 ft. per minute and one man operates the whole tramway.

From the crusher and storage bins, a second transportation system takes the lime to the two kilns which are located about 100 ft. away. These are fired with crude oil under pressure, and are charged from the top.

Working with one of the best natural grade lines to the coast, the company feels that it has one of the finest prospects for marketing it could have. The freight rates are low and the Idaho firm has already found itself able to compete successfully in Seattle, Astoria, Salem, Willamette, Vancouver, Wash., and Vancouver, B. C.

The principle product of the new plant will be large-size rock for use in the paper mills along the Northwest coast. However, the plant will also turn out lime for all sorts of commercial purposes, as well as agricultural lime, chicken grits, and similar products. It is contemplated at present to have the plant produce about 25 tons of burned rock daily, besides 30 tons of ground rock and grits and 300 tons of unground rock for paper.

Walter Harr of Portland, Oregon, is president of the new company and Elmer Harr is vice-president. L. A. Strickfadden was named secretary-treasurer. The concern was incorporated for $500,000.—*Lewiston* (Idaho) *Tribune*.

Refractories Institute Meeting

THE American Refractories Institute, Pittsburgh, Penn., will hold its annual meeting May 21 and 22 at the French Lick Springs hotel, French Lick, Ind. Dorothy A. Texter, 2202 Oliver Bldg., Pittsburgh, Penn., is secretary.

A Patent on Returning Cement-Kiln Flue Dust to Kiln

Making a Slurry of the Flue Dust and Allowing It to Stand Before Feeding It to the Kiln

A PATENT was issued October 23, 1928, to Walter A. Schmidt, president of the Western Precipitation Co., Los Angeles, Calif., on the "art of cement manufacture" (No. 1,688,882), which describes a method of returning recaptured flue dust to the kiln in the wet process of manufacture to avoid building rings or cakes at the feed-end of the kiln. The invention is described as follows:

"This invention relates to the manufacture of portland cement and particularly to the so-called 'wet process' for the manufacture of portland cement. In processes of this type the raw materials are first reduced to the form of a slurry by grinding in the presence of water and the resulting slurry is introduced into the kilns, wherein the water is first driven off and the materials are then calcined and finally clinkered. The heating of the materials in the kilns is ordinarily effected by passing hot combustion gases therethrough countercurrent to the materials, and these gases generally carry off a considerable amount of finely divided solids in suspension therein, together with certain volatile constituents of the materials in gaseous form, which later recondense in the form of fume. It is customary to recover from the exit gases from the kiln, both the mechanically entrained dust and the fume produced as above described, since if these materials were allowed to pass out through the stack they would not only represent a loss of valuable material, but would also be obnoxious and injurious to life and property in the vicinity.

"The recovery of this solid material from the gases leaving the cement kilns may be accomplished by electrical precipitation, or by means of settling chambers or spray chambers or by any other usual or well-known means for separating suspended solids from gases. The material so collected may be termed cement kiln dust and the terms 'dust' and 'cement kiln dust' as used hereinafter are to be understood as including both mechanically entrained dust and also fume resulting from volatilization and recondensation of volatile constituents of the raw mix as above described.

"It is frequently desired to utilize or conserve part or all of the solid materials so recovered from the kiln gases by returning the same to the kiln with the raw mix slurry, but it is generally impossible or inadvisable to feed this material in a dry state to the kilns along with the slurry, since such materials are of uncertain and non-uniform composition or 'off mix' due to varying proportions of dust and fume, and also to the coal contained therein in the case of coal-fired kilns. On the other hand, if the recovered dust is added to the raw slurry in order to permit a correct mix to be maintained, difficulties are encountered due to the fact that the addition of this material causes the slurry to 'set up' and become so hard or thick that it cannot be satisfactorily handled.

"I am not certain as to the entire cause of this coagulating or setting-up effect, but it appears to be due in part at least to hydration of gypsum formed by interaction of free lime with sulphur dioxide and oxygen in the kiln gases or with alkali sulphates in the dust. The gypsum so formed would tend to take up water of crystallization and set in the same way as ordinary plaster of Paris. It is possible that the alkali sulphates also act upon the calcium carbonate contained in the raw mix to form calcium sulphate, and that some alkali carbonates act upon the free lime resulting in the formation of calcium carbonate having the properties of plaster. Any of the above reactions would tend to cause the setting-up to occur. As above stated, however, I do not wish to be limited to any theory as to the causes of this setting-up or as to the manner in which the procedure hereinafter described operates to eliminate such action.

A Separate Slurry

"I have found, however, that if the dust recovered from the cement kiln gases is made into a separate slurry by addition of water thereto and is allowed to stand for a suitable period of time, for example, for several days, and is then introduced into the main raw mix slurry, the resulting mixture shows substantially no greater tendency to harden or set-up than does the main slurry without addition of the dust thereto. If it be assumed that the hardening action is due to formation of gypsum or calcium carbonate as above described, then the effectiveness of the above procedure may be due to the fact that the formation of such materials is allowed to take its course before mixture with the main slurry, so that no further tendency to set-up occurs after such addition. As above stated, however, I do not wish to be limited to this explanation of the operation of the invention.

"Considerable latitude is permissible in the manner of carrying out the treatment of the dust before addition to the main slurry; and the proportion of water to be added to the dust in such treatment, the temperature required, the time of treatment and other factors may advantageously be varied as found most suitable for different plants, due to variations in the composition and nature of the dust and raw mix. As an example of one particular method of carrying out the invention, however, the dust recovered from the cement kiln gases may be mixed with water to form a fairly heavy slurry, by addition of say 25 parts of water to from 50 to 75 parts of dust by weight. The mixture of dust and water may be agitated if desired to secure thorough mixing thereof and this slurry may be stored in any suitable place, for example, in storage tanks, or may be run out on to the ground, for example, near the place from which the raw materials are obtained. If the slurry is made sufficiently heavy, as, for example, by mixing 25 parts of water with 75 parts of dust, it may simply be allowed to stand on the ground and harden. After suitable time, for example, from eight to twelve days, the resulting thickened or hardened material may, if necessary, be reground, and sufficient water may be added to bring the moisture content up to that of the main slurry, and then mixed in suitable proportions with such main slurry. The proportion in which the dust slurry or hardened material resulting therefrom is mixed with the cement slurry may vary according to the proportion of dust produced in the plant, but such dust slurry may in general be added in any proportion up to 20% or more of the main raw mix slurry. It has been found that addition to the raw mix slurry of dust treated in the above described manner shows substantially no tendency to cause hardening or setting-up to occur in the mixture, so that the same may be handled and introduced into the kilns in the usual manner.

"As a modification of the process, particularly when the dust slurry is made sufficiently thick to actually harden and is stored near the rock supply from which the raw materials are derived, the hardened slurry, after a suitable period of aging, may be fed in suitable proportion along with the rock to the mills grinding the raw materials, so as to be ground wet along with the other raw materials to form a slurry of suitable consistency for introduction to the kilns. It will

be seen therefore that the dust, after separate treatment with water as above described, may be introduced into the raw mix slurry either by direct addition to such slurry or by adding it to the raw materials and then adding water to the mixture to form the slurry.

"I claim:

"1. In the wet process of manufacturing portland cement, the process comprising recovering dust from the kiln gases, mixing such dust separately with water and maintaining such dust and water in contact with one another for a period of time, and then introducing the resulting mixture into the raw mix slurry.

"2. The process as set forth in claim 1, in which the dust and water are mixed in such proportions as to form a stiff slurry, and the same is allowed to stand for a sufficient period of time to cause the same to harden.

"3. In the manufacture of portland cement by the wet process, the steps which comprise recovering dust from the kiln gases, mixing water with such dust to form a stiff slurry, allowing said slurry to stand for a sufficient time to set up, and then reducing the resulting material to finely divided condition and introducing the same into the raw mix slurry.

"4. In the manufacture of portland cement by the wet process, the steps which comprise recovering dust from the kiln gases, mixing water with such dust and allowing the mixture to react for a sufficient period of time so that subsequent addition thereof to the raw mix slurry will not materially increase the tendency of such slurry to set up, and then introducing said mixture into the raw mix slurry.

"5. The process as set forth in claim 4, in which said mixture is allowed to react for a period of several days before addition to the raw mix slurry.—Walter A. Schmidt."

Characteristics of Concrete Shown by Core Tests

A STUDY of some 2200 cores drilled from the highways of Maryland has been made co-operatively by the University of Maryland, the U. S. Bureau of Public Roads and the Maryland State Roads Commission. From this a number of things were developed which are of interest to the aggregate producer as well as to those who are interested in concrete as a paving and building material. A report of this study is made in an article by A. N. Johnson, dean of engineering in the University of Maryland, published in *Public Roads* for September 3, 1828.

Differences in strength corresponding to differences in the aggregates used were found. But there were even greater differences in the strength of cores taken from adjacent parts of the same road. There were other differences due to known and unknown factors, but by arranging a great many of the specimens in groups and figuring the mean of variations a "modulus of variation" was found, and this is shown to correspond with the modulus of variation found by grouping many laboratory results in the same way. A minor but no less interesting point brought out was that the strength of ready mixed concrete was increased by hauling it distances up to three miles.

Summary of Crushing Strength Tests

The average crushing strength of all cores was found to be 4079 lb., varying from 1800 lb. (four cores) to 7800 lb. (one core). But 73% of the cores tested between 3000 lb. and 5100 lb., from which it is judged that concrete testing 3000 lb. and upward may be reasonably expected in ordinary paving jobs.

The roads tested were of different ages, from 1 yr. to 11 yr. The strength results from these were grouped according to the ages of the roads from which they were taken. The highest average strength was found in the 3-yr. group (4344 lb.) and the lowest for the 9-yr. group (3790 lb.). The range of 554 lb. being equally divided above and below the grand average of all strengths (4079 lb.) it was judged that no definite influence on the strength may be attributed to age, within the age limits of the specimens tested.

Comparison of Concretes of Different Aggregates

An analysis of the crushing strengths of concrete from various aggregates showed that the highest average was from the group made from "mixed rock" which was possibly crushed gravel. This tested 4278 lb. The limestone aggregate group averaged very little less, 4241 lb., and the slag aggregate group 3492 lb. The report says that too much significance should not be attached to these results, as the number of specimens in some groups was too small for generalizing from the tests. Only 12 slag specimens, for example, were available.

The table giving the results of the tests of concrete made from various aggregates follows:

Aggregate	Number of tests	Average compressive strength lb. per sq. in.
Granite	227	3667
Gravel and rock	139	4199
Mixed rock	168	4278
Quartz gravel	601	3871
Sandstone	40	3891
Slag	12	3492
Trap	27	3838
Limestone	816	4241

To show that variations in concrete made from the same aggregate might be even greater, a comparison is made of three cores taken from the middle and the right- and left-hand sides of the same road slab. This group was picked at random from many groups of the same kind:

Core No.	Compressive Strength, lb./sq. in.	Variation from Mean Value, %
59	3000	14
60	4200	20
61	3400	3

Modulus of Variation

Results of tests were put in groups of three, similar to that shown above, except that a few were put in groups of six or nine. The variation of each core from its group mean was plotted and a mean of these variations from 1557 cores was found to be 8.2%. This is called the modulus of variation for all the specimens plotted. Interesting comparisons with other large number group tests are given in the paper. Thus, from 195 tests of beams made at the university the modulus of variation was found to be 7.1%. For 416 specimens tested at the Lewis Institute the modulus was 10%; for 363 specimens, 7.9%. The modulus of variation for 5600 specimens tested at the Lewis Institute was 7.8%. These were divided into groups of 10, each group being of supposedly identical concrete. Another grouping of 1300 specimens gave a modulus of variation of 8.1%.

The article makes a comparison with a report of 392 tests of the tensile strength of steel, made at the Watertown Arsenal. Grouped in the same way a modulus of variation of 0.62% is found. But the curve of the variations is practically the same as the curve of the variations of concrete strengths when it is plotted on a proportional scale.

From this it is concluded in the paper that the modulus of variation is indicative of the homogeneity of the material tested. It was found that a large majority of the results have a variation of less than 16%, and Dean Johnson suggests that where a group of specimens is tested for an average result any specimen which tests more than 16% or 18% from the mean of the group tests should be thrown out as exceptional. Where only a small number of tests was available exceptional results would unduly affect the mean value.

Hauling Mixed Concrete

An interesting set of cores was that taken from four miles of road paved with concrete that was trucked from a central mixing plant. Six cores were drilled at every quarter mile for the whole distance and the results of testing these cores were graphed. The graph shows plainly that there was a constant increase in strength up to three miles from the mixing plant, after which there was a slight falling off in strength. It is concluded that hauling mixed concrete three or four miles in no way injures it and probably increases its strength.

An Extraordinary Texas Sand and Gravel Operation

More and Moore, Chillicothe, Texas, Remove 12 Ft. of Overburden for 6 Ft. of Sand and Gravel

ONE OF THE MOST extraordinary sand and gravel operations ever noted by ROCK PRODUCTS is the plant of More and Moore on the Pease river, near Chillicothe, Texas. The deposit is only 6 ft. thick and it has 12 ft. of soil above it. The production is only seven or eight cars a day, and it would not seem that such an operation could be profitable, comparing it with the big deposits and plants of the East and the Middle West. But the owners find it profitable and they are experienced sand and gravel men operating several plants in the state. One reason is that sand and gravel sell at a higher price than in many other parts of the United States.

Another reason, perhaps, is the nature of the material and the extreme simplicity of the operation. Although it is covered by so much overburden, the material in the deposit is almost unbelievably clean. Looking at it just as it comes from the deposit one would be willing to take an oath that it had passed through a washing plant. Even with the little silt that is accidently included from the stripping, the silt runs only 2 to 3%, according to one of the owners, and its appearance bears out his statement.

Possible Origin of Deposit

It would be interesting to know how such a deposit was formed. It is evidently part of an old river bed or terrace, although it lies in flat country and there is nothing on the surface to indicate this. The pebbles are all smooth and well rounded showing that they must have traveled some distance. They are very hard, most of those examined being of quartz and quartzite. The most probable surmise is that they come from the hills a few miles distant which are at the end of the Wichita mountains and which are very much eroded.

Method of Operation

The material is stripped and dug by the same machine, a No. 30 Bucyrus dragline excavator with a 40-ft. boom and a 1½-yd. Page bucket. Power is supplied by an Enterprise gasoline engine which has a record of six years' service with only one thorough overhauling. The system of digging is the usual one, the machine making a cut by the side of a cut already made into which it side-casts the strippings.

Dragline stripping 12 ft. of overburden to reach the 6 ft. of gravel at the More and Moore plant

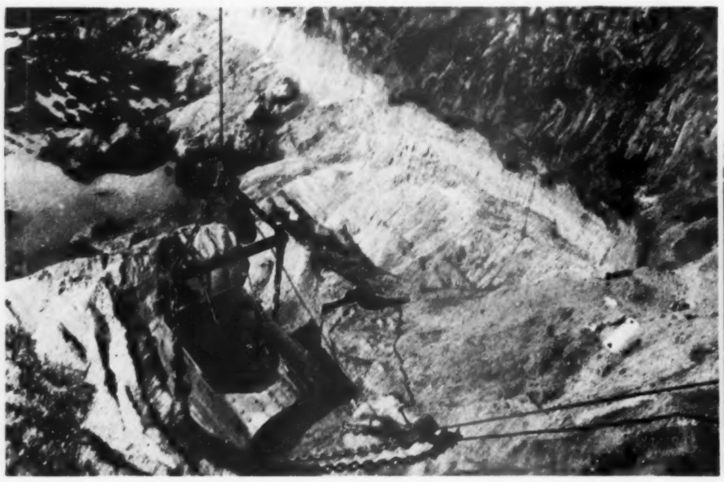
The company has two of these machines, the other being used to dig pit run material which is shipped as railway ballast.

The dragline was working about a half-mile from the plant at the time it was visited and the material was sent in over a 24-in. gage track. The cars are "Westerns" holding 2-yd. each, but it is possible to load them more heavily. Two 6-ton Whitcomb gasoline locomotives pull the cars in trains of eight or ten. The country is so flat that for most of the way the track has only to be laid on the ground, but near the plant a considerable fill had to be made which also serves as a dam that holds enough water to justify washing if the material needed to be washed.

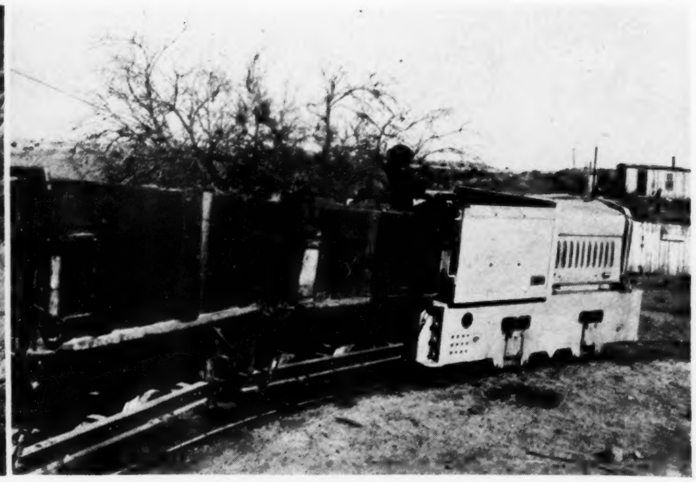
Only Two Products Made

But as all that the bank material needs is screening, the plant is as simple as possible. The cars are dumped on a grizzly of pipes spaced 3 in. apart. From this it goes to a hopper and is fed into the boot of an elevator 45 ft. high with 14-in. buckets. This discharges to an Austin screen 8 ft. long and 40 in. in diameter. Only two products are made, sand and gravel for concrete aggregate. There is a pair of vibrating screens, made at the plant, below the revolving screens but they were not found necessary and are now out of use. There

The gravel plant of More and Moore at Chillicothe, Texas, showing the power house in the center



Dragline bucket at the bottom of the pit. Note the sharp line between the red earth overburden and the gravel



Locomotive hauling train of 2-yd. cars from the pit to the plant at the More and Moore operation

is also a small crusher that was intended to be used to crush oversize, but the amount of oversize is too small to bother with. All that the material needs is to be split into gravel and sand to make two salable products. A 25-hp. Fairbanks-Morse engine, using coal oil for fuel, drives the whole plant.

In a rainy country it would not be possible to run a plant this way, but in this part of Texas there is just about rain enough to make a crop and no more, and the rain comes in the months when sand and gravel are not much in demand.

The plant is on the Kansas City, Mexico and Orient railroad in a part of the country that is developing rapidly after a somewhat lengthy period of inaction. Towns are building, streets are being paved and roads laid and these provide a fairly close market for the output of the plant.

The company's main office is in Chillicothe. It is an incorporation, R. L. More being president and T. C. Moore secretary and treasurer. The other owners are C. M. Moore and R. L. More, Jr., and all of these are directors. The largest plant which the company operates is at Bronte, Texas. It produces 20 cars a day.

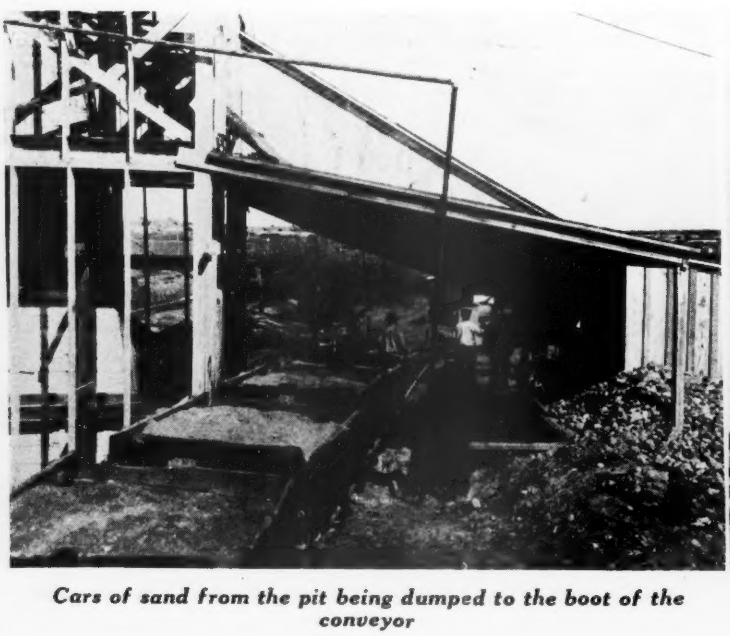
Cushing Stone Co. Acquires Another Gravel Plant

THE Cushing Stone Co., of Schenectady, N. Y., has purchased the gravel washing plant of Neil F. Ryan at Scotia, including the 160 acres of property on which the plant is located. The property was bought because the territory does not consume enough stone and sand to warrant the steady operation of two plants, it was said at the offices of the Cushing company. It is the intention to operate one plant for shipments by truck and the other for shipments by rail. During the early and late months, when construction is slack, one plant can easily produce enough material to supply the demand, it was said.

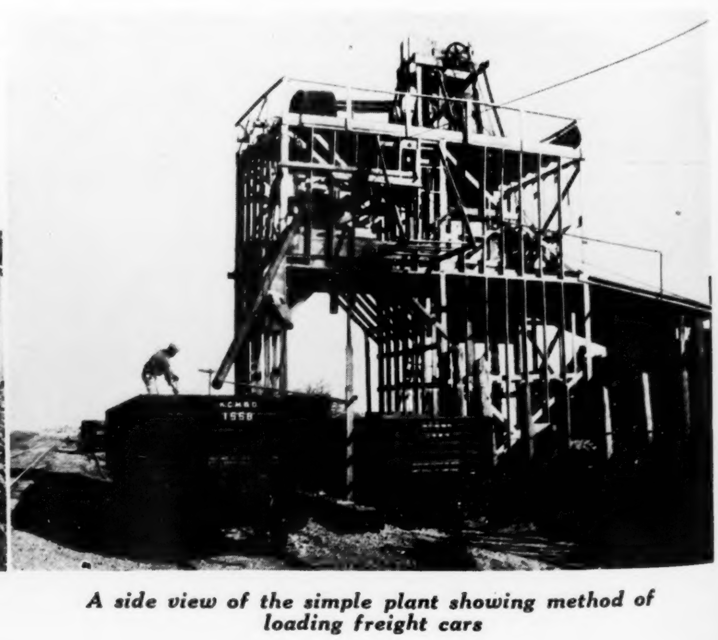
The Cushing Stone Co. and its subsidiaries, the Schoharie Stone Corp. and the Scotia Stone and Gravel Co., owns five sand plants and quarries in Amsterdam, Cranesville, Schoharie and Scotia on the New York Central, West Shore, Delaware and Hudson and Boston and Maine railroads. Deliveries are also made over the Barge canal.—*Schenectady* (N. Y.) *Union Star.*

Kingsport Cement Men Go to Des Moines

THE PENNSYLVANIA-DIXIE CEMENT CORP., which a year ago acquired the Pyramid Portland Cement Co. plant at Des Moines, has transferred R. A. Bechtold, general superintendent of the Pennsylvania-Dixie's plant at Kingsport, Tenn., to Des Moines as superintendent, and M. L. Silcox, also of the Kingsport unit, is coming as chief chemist. Officials predict cement demand this year will reach new levels, and the Iowa plant is being prepared in anticipation of that demand, with expectation that its 1929 production will exceed any previous year.



Cars of sand from the pit being dumped to the boot of the conveyor



A side view of the simple plant showing method of loading freight cars

Effect of Adding Various Percentages of Diatomaceous Earth to Portland Cement Mixtures

By Alton J. Blank

Formerly Chief Chemist, La Tolteca Cia. de Cemento Portland, S. A., Tolteca, Now General Superintendent and Supervising Chemist, Compania de Cimento Portland Lando, Puebla, Puebla, Mexico

IT IS GENERALLY conceded that an addition of some finely pulverized forms of silica to some brands of portland cement gives decidedly advantageous results in that greater strength values of the cement are received.

While this increase in strength values of some cements is had through the addition of pulverized silica, other cements are very little benefited, if at all.

This fact may be explained in part as follows:

In correctly proportioned cements where there is present sufficient available silica for combination with all of the lime in the burning process, the percentage of free, or uncombined lime, in the cement is very small. An addition of pulverized silica to a cement of this nature tends to increase the strength value of the cement very little, if at all.

In incorrectly proportioned cements where there is present insufficient silica for combination with all of the lime in the burning process, the percentage of free, or uncombined lime is usually great. An addition of finely pulverized silica to a cement of this nature tends to increase the strength values of the cement in proportion to the amount of free lime present, and in such cements an admixture of finely pulverized silica, in the form of clean sand, diatomaceous earth, and other forms of silica, may increase the strength of the cement as much as 100%.

Alton J. Blank

The explanation would appear to be that this finely pulverized silica reacts favorably with this uncombined, or free lime, in fact, tests carried out would tend to confirm this theory.

Series of Tests

The initial test made consisted of a series of compression tests where admixtures of diatomaceous earth were made to ordinary 1 part cement to 3 parts sand mixes, this earth admixture ranging from 5 to 50% by weight of the cement.

The cement used contained free lime in percentages above the average.

The sand used was Ottawa silica sand.

The normal consistencies of the mixtures was kept constant in all test mixtures.

Specimens were stored in the usual way, 1 day in damp closet and the remaining time in tanks where the temperature of the air in the damp closet and the water in the tanks was kept at 21 deg. C. The diatomaceous earth had a fineness 92.0% passing a 200-mesh screen.

In view of the fact that the results obtained in Test No. 1 show that the greatest increases in strength were received with 5 and 10% admixtures of diatomaceous earth, another series of tests were started with a cement having only a slightly above the average percentage of free lime present (Test No. 2).

In order to find out whether these increased strengths received in the small test specimens were had in ordinary concrete mixtures a series of compressive test specimens were made up using normal 1:3:6 mixtures (Test No. 3).

The same cement was used as in Test No. 1.

The sand was an ordinary grade of river sand.

The aggregate consisted of crushed limestone of normal modulus.

The slump was kept constant in all mixes at 1½ in.

For the fourth test a cement containing only an insignificant quantity of free lime was used.

The sand was ordinary river sand.

TEST No. 1.—COMPRESSIVE STRENGTH 2-IN. x 2-IN. CUBES
1:3 sand mixtures

Parts cement	Parts diatom. earth	Parts Ottawa sand	7-day	Strength values, per cent	28-day	Strength values, per cent	2 months	Strength values, per cent
1.0	0.0	3	3040	100	5390	100	5734	100
0.95	0.05	3	5815	191	7293	135	7391	128
0.90	0.10	3	5515	181	7400	137	7520	140
0.85	0.15	3	3190	105	6710	124	6913	120
0.80	0.20	3	3660	120	6670	123	6789	118
0.75	0.25	3	3610	119	5840	108	6930	120
0.70	0.30	3	2570	84	4065	75	4040	70
0.60	0.40	3	1597	52	3020	56	4070	70
0.50	0.50	3	1220	40	2705	50	3586	62

TEST No. 2.—COMPRESSIVE STRENGTH 2-IN x 2-IN. CUBES
1:3 sand mixture

Parts cement	Parts diatom. earth	Parts Ottawa sand	3-day	Strength values, per cent	7-day	Strength values, per cent	28-day	Strength values, per cent
1.000	0.000	3	2475	100	4055	100	6176	100
0.995	0.005	3	2985	120	4687	115	6821	110
0.990	0.010	3	3780	152	4910	121	7492	121
0.980	0.020	3	3920	158	5077	130	6490	105
0.960	0.040	3	3939	158	6466	160	5830	94
0.930	0.070	3	3765	151	5433	134	6371	103
0.920	0.080	3	3488	139	5071	130	6740	107
0.900	0.100	3	2912	118	4212	104	6278	101
0.850	0.150	3	2310	94	4420	109	5490	89

TEST No. 3.—COMPRESSIVE STRENGTH 6-IN. x 12-IN. CYLINDERS
Concrete mixes 1:3:6

Parts cement	Parts diatom. earth	Parts river sand	Parts aggregate	3-day	Strength values, per cent	7-day	Strength values, per cent	28-day	Strength values, per cent
1.00	0.00	3	6	143	100	344	100	856	100
0.99	0.01	3	6	155	108	378	109	971	113
0.98	0.02	3	6	168	117	410	119	1110	130
0.97	0.03	3	6	194	135	476	138	1169	136
0.96	0.04	3	6	209	146	514	149	1243	145
0.95	0.05	3	6	276	193	667	200	1322	154
0.94	0.06	3	6	298	208	601	174	1407	164
0.93	0.07	3	6	332	232	537	160	1220	142
0.92	0.08	3	6	238	166	455	133	1155	134

TEST No. 4.—COMPRESSIVE STRENGTH 6-IN. x 12-IN. CYLINDERS
Concrete mixes 1:3:6

Parts cement	Parts diatom. earth	Parts river sand	Parts aggregate	3-day	Strength values, per cent	7-day	Strength values, per cent	28-day	Strength values, per cent
1.000	0.000	3	6	284	100	558	100	1208	100
0.975	0.025	3	6	245	86	482	86	1138	94
0.950	0.050	3	6	223	78	501	89	1148	95
0.925	0.075	3	6	216	76	490	87	1136	94
0.900	0.100	3	6	196	68	437	78	1010	83
0.875	0.125	3	6	155	54	334	60	908	75
0.850	0.150	3	6	140	49	270	49	810	67

TEST No. 5.—COMPRESSIVE STRENGTH 4-IN. x 8-IN. CYLINDERS
Concrete mixes 1:2½:5½

Parts cement	Parts diatom. earth	Parts river sand	Parts aggregate	3-day	Strength values, per cent	7-day	Strength values, per cent	28-day	Strength values, per cent
1.00	0.00	2.50	5.50	164	100	436	100	1002	100
0.99	0.01	2.50	5.50	160	98	424	97	1036	103
0.98	0.02	2.50	5.50	193	117	437	100	1089	108
0.97	0.03	2.50	5.50	198	119	499	113	1138	113
0.96	0.04	2.50	5.50	198	119	483	110	1249	124
0.95	0.05	2.50	5.50	198	119	481	109	1324	132
0.94	0.06	2.50	5.50	195	117	497	112	1337	133
0.93	0.07	2.50	5.50	201	120	563	129	1428	142
0.92	0.08	2.50	5.50	208	126	608	139	1507	150
0.91	0.09	2.50	5.50	207	125	699	160	1494	149
0.90	0.10	2.50	5.50	276	168	699	160	1701	170
0.89	0.11	2.50	5.50	309	182	731	167	1716	171

TEST No. 6.—COMPRESSIVE STRENGTH 4-IN. x 8-IN. CYLINDERS
Concrete mixes 1:2½:5½

Parts cement	Parts diatom. earth	Parts river sand	Parts aggregate	3-day	Strength values, per cent	7-day	Strength values, per cent	28-day	Strength values, per cent
1.00	0.00	2.50	5.50	145	100	428	100	1297	100
0.99	0.01	2.50	5.50	160	110	467	109	1304	101
0.98	0.02	2.50	5.50	182	125	537	127	1473	113
0.97	0.03	2.50	5.50	222	153	589	137	1516	117
0.96	0.04	2.50	5.50	229	153	551	128	1545	119
0.95	0.05	2.50	5.00	213	151	635	148	1660	128
0.94	0.06	2.50	5.50	270	186	781	182	1670	129
0.93	0.07	2.50	5.50	273	186	807	188	1820	140
0.92	0.08	2.50	5.50	325	224	899	210	1932	149
0.91	0.09	2.50	5.50	339	233	904	211	2038	157
0.90	0.10	2.50	5.50	434	300	969	226	2072	159
0.89	0.11	2.50	5.50	576	397	1109	259	2237	172
0.88	0.12	2.50	5.50	585	400	1160	271	2374	183

TEST No. 9.—TENSILE STRENGTH 1:3 SAND BRIQUETTES (Lb. per Sq. In.)

Per cent diatom. earth added	3-day	7-day	14-day	28-day	2-months	3-months	6-months
0.0	196	264	301	363	389	424	451
0.5	215	299	319	367	394	420	448
1.0	202	268	325	334	385	429	442
2.0	197	270	354	374	451	462	462
3.0	224	259	363	378	420	429	440
4.0	218	303	334	345	455	464	473
5.0	213	304	354	396	396	506	482
6.0	220	303	345	374	407	434	473
7.0	242	316	389	376	448	477	484
8.0	187	273	304	374	464	501	490
9.0	191	224	347	363	448	451	451
10.0	158	299	358	374	466	455	517
15.0	178	255	341	365	422	404	506
20.0	152	255	310	451	419	455	484
25.0	160	255	319	308	400	367	464
30.0	145	228	297	338	426	426	477

The aggregate was crushed limestone of normal fineness modulus.

The slump was kept constant around 2½ in.

The specimens were stored in damp sand.

For the fifth test a cement containing a large percentage of free lime was used.

The sand was ordinary river sand.

The aggregate was crushed limestone having a low fineness modulus.

The slump was kept constant around 1 in.

The specimens were stored in damp sand.

For the sixth test a cement containing a large percentage of free lime was used.

The sand was ordinary river sand.

The aggregate was crushed limestone having a low fineness modulus.

The slump was kept constant around 1¾ in.

The specimens were stored in damp sand.

For tests Nos. 7 and 8 a cement containing only a small percentage of free lime was used. This cement was a normal cement. The sand and aggregate were the same as in other tests, while the slump was kept in the Test No. 7 at 1¼ in., and in Test No. 8 at 2 in. The concrete mixtures were in both tests 1:2:4.

In view of the fact that there was practically no variation in strength of any of the specimens where the admixture of diatomaceous earth was from 1% to 10%, the results are not shown.

The 1:3 sand briquettes made up with admixtures of diatomaceous earth in percentages up to 20% by weight of the cement gave more or less uniform tensile strengths for all admixtures.

In all tests made the finely pulverized diatomaceous earth was mixed by adding it to the cement and allowing the sample, with the aid of 10 or 15 ordinary grinding balls, to be rotated in a small tubemill for 5 min.

In the next test a cement containing 0.78% of free lime was used, fineness being 87% passing a 200-mesh screen.

In the above test additions of diatomaceous earth to the cement in quantities up to 30% by weight of the cement had little effect on the strength of the cement with the exception of the latter additions where the short time strengths fell off slightly while the latter day strengths were slightly higher.

Windsor (Ont.) Sand and Gravel Co. Sold

THE WINDSOR SAND AND GRAVEL CO., LTD., Windsor, Ont., has become part of the Canada Paving Co. group of companies in the Border Cities, it was announced on February 18. Louis Merlo, president and general manager of the Canada Paving Co., becomes president of the Windsor company. Other directors are D. Herbert Wollatt, John D. Chick, D. R. McLeod and Leo Ryan.

Previously the capital stock consisted of 400 authorized and outstanding shares of $100 per value. These are exchanged for 4970 shares of no par value.

Rock Products' Editor Investigates Compressed-Air Tank Explosion

Some Suggestions of an Experienced Operating Man on How to Avoid Similar Accidents

By W. B. Lenhart
Associate Editor, Rock Products

ATLANTA, GA., newspapers of February 28 carried first-page stories of a disastrous explosion of a compressed-air tank at the quarry of the Stone Mountain Granite Co., Decatur, Ga., at 4 o'clock on the afternoon of that day, killing 7 men and injuring others.

On the day that this explosion took place I was in Atlanta and visited the scene of the disaster as soon as possible and made the following observations:

The air receiver that blew up had a diameter of 5 ft. and was approximately 20 ft. long, built of $\frac{5}{16}$-in. boiler plate, with the heads belled outward about 5 in. The cylinder was well made, the outside appearance was indicative of good workmanship and materials, and as a whole not badly pitted or rusted. The heads were well riveted to the cylinder and did not give way, the plate itself shearing off at the right angled bend, which was necessary so as to be able to rivet the head to the cylinder proper.

The cylinder was in a horizontal position, presumably level, but judging from the foundation, which was of cut stone, the receiver was at least 3 in. low at the end opposite the air intake line, and this point, in my mind, accounts for the disaster.

Near Time-Clock Shanty

The cylinder, resting on the cut stone foundation, had its long axis in line with the small structure housing the quarry time clock, and the end of the cylinder was roughly 10 ft. from this shack; although the structure was completely demolished, there might have been a variation of 2 to 4 ft. in this distance. Questioning any of the quarry men was practically useless, as all questions were answered by an "I don't know."

The end of the cylinder nearest the shack blew out its entire end section, hurling the 5-ft. diameter section through the shack and men who were lined up there to punch the time clock. Ten minutes earlier or later, there might have been no loss in life.

The 5-ft. diameter piece of steel plate was separated from the balance of the cylinder as clean as if cut by an acetylene torch, and the fractured ends showed signs of crystallization, probably due to the manipulation at the formative stages of the fabrication of the cylinder end. The edges of the head were folded at approximately right angles to permit lapping on the sides of the cylinder.

At the top of the section that blew out was what at one time was a crack about 12 in. long, which had been welded with some kind of a welding torch. This weld was poorly executed and, in my mind, would account for this end blowing out, and not the opposite end.

The cylinder proper was blown approximately 50 ft. in the opposite direction from the end that went through the timekeeper's shack.

Oil Residue in Tank

On inspecting this drum I found between 50 and 75 lb. of foreign material, which was mostly iron oxide (rust) saturated with oil. Most of this material was in the back end of the cylinder and was banked up to a depth of 3 to 4 in. The top layers were reddish in color, and on digging with my fingers to the bottom I found the color changed to a deep black and the material was literally saturated with oil. There was a pronounced odor in the cylinder, resembling that secured from burning oil with a deficiency of air, and it is to be noted here that my inspection was about 36 hours after the explosion.

The tank was about midway between the quarry and the compressors, roughly 800 ft. from the compressor plant, and air was delivered to this cylinder through a pipe line which sloped upward to the cylinder several feet, judging from appearances.

The cylinder acted as a receiver between the compressor and the drills and was connected to the intake pipe and service pipe by a tee which entered the cylinder at the bottom and near the end that blew out, connection being by a flange riveted to the cylinder.

Apparently Inadequate Facilities for Cleaning Tank

About the center and at the bottom of the cylinder was a ½-in. nipple and valve, presumably for blowing off or drainage purposes. This outlet, the intake, and a manhole at the top were the only outlets to the tank. No safety valve or blow-off cock was to be found. The conditions in the cylinder apparently approached conditions similar to those in the head of a Diesel or oil engine, namely, oil, air and compression; all that was needed was a spark or heat to ignite this explosive mixture.

This spark could have been supplied by static electricity, but that is hard to explain, as the pipe line passed through the earth, which was wet from recent rains and should have grounded any stray currents. (I believe that someone should investigate the reactions possible between oil, oil residues, water, and iron oxide, all under pressure, and see if a reaction would be possible that would give off sufficient heat to ignite an explosive mixture.)

As the cylinder was about 800 ft. from the compressor, it is possible that the cylinder was not drained at regular and frequent intervals by the compressor operator, and for a like reason by the quarry foreman, and if it was flushed regularly it was not sufficient, as the centrally located and small outlet was *higher* than the end of the cylinder that was not blown out by the force of the explosion.

The foundation, considering the force of the explosion, was only slightly damaged and it was perfectly obvious that the above observations as to whether the cylinder was level or not are in essence correct.

Also, judging from the appearance of the inside of the cylinder, the good end was lower than the end that blew out, as "high water" marks of oil indicated this condition.

A Lesson for Quarry Operators

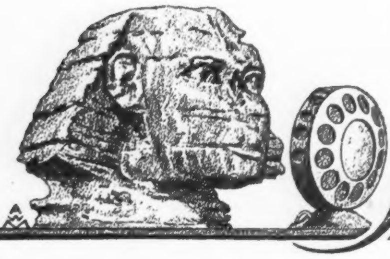
The whole lesson of this unfortunate accident is, in my opinion, to make sure that there is at least a 2-in. valve *located at the lowest part of the cylinder and which should be opened every day, allowing the pressure to drop from the operating pressure to atmospheric.* It also would be more reasonable to set the cylinder in a vertical position to insure proper drainage.

Judging from newspaper reports, the explosion was due to a stuck safety valve at the compressors, but ruptures due to a steady pressure usually open up the weakest seam more with a ripping action, thereby releasing the pressure and not with an explosive force.

Personally, I thought that every quarry operator knew the necessity of properly blowing off the air receivers, it being such common knowledge that it would be comparative to finding a bookkeeper who did not know how to fill a fountain pen, but this accident shows the necessity of continually pounding away to insure proper safety precautions.

What Furnished Spark or Heat?

If someone would come forth with a logical and easily understood explanation as to what would supply the "spark" or heat of ignition, then quarrymen would be more prone to believe my explanation as to the causes of explosions of this nature. They can see the logic of the oil-pressure-air theory, but not the logic as to the source of the "spark." Once that is brought home to them it would be a big step in preventing accidents of this nature. The explanation must be easily understood and not obstructed with "molecular phenomena" and "static" and other vague terms, but one that every Tom, Dick and Harry can understand.



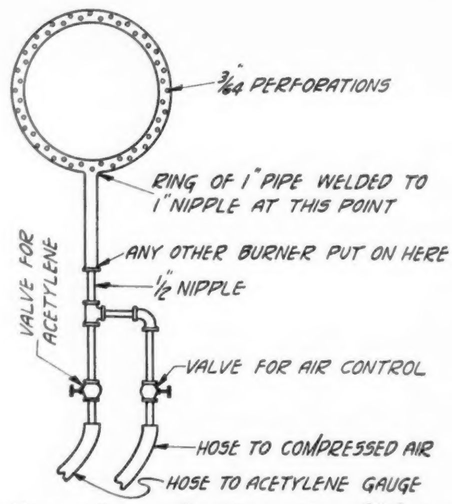
Hints and Helps for Superintendents

Burner for Pre-heating Iron or for Similar Work

W. L. HOME,
Fort Lee, N. J.

AT most all crushing plants or construction jobs of any kind there are many occasions to use portable heating devices to heat bearings, castings, mantels on crushers or eccentrics to shrink on iron bands and to do similar work. Many bearings, that should be pre-heated before pouring, are poured when the parts are cold because it is almost impossible to get that particular place heated without going to considerable trouble.

There are many heaters on the market for doing this kind of work, but I do not know of any which is more easily made and of so much practical use as the one described. All that is required is one acetylene tank, a set of gages for a burning torch, a few pipe fittings, some valves and the two hoses from the burning outfit. Any shape burner could be made up, but the one described was designed to pre-heat the mantels on crushers before pouring in the zinc. It was of circular construction as shown in the sketch. The size and shape of the burner could be altered to suit different conditions. The holes in the burner are 3/64 in. in diameter and staggered so as to throw the flame over more territory. The burner was made of 1-in. pipe, but reduced to ½-in. at the end of the nipple at the burner. The acetylene hose is connected with the gage on the acetylene tank and the other hose to a convenient compressed air line. After getting the correct mixture there will be a good hot clean flame that requires but little attention.



Burner for pre-heating parts, which can be easily made

Using a Shovel to Install a New Tank on a Dinky

THERE are undoubtedly many uses to which a steam shovel may be put which never occur to the operator until necessity brings them to mind. The accompanying photograph shows a shovel at the Fairview, Penn. plant of the Nickel Plate Sand and Gravel Co., of Erie, Penn., doubling very effectively as a crane. According to L. E. Redding, superintendent of the plant, it was necessary to install a new and larger tank on one of the company's dinkies. The dinky was placed beside the shovel and the latter picked up the new tank by means of a chain fastened to its two ends, and placed it gently in position on the locomotive. The picture shows very well how the job was done.

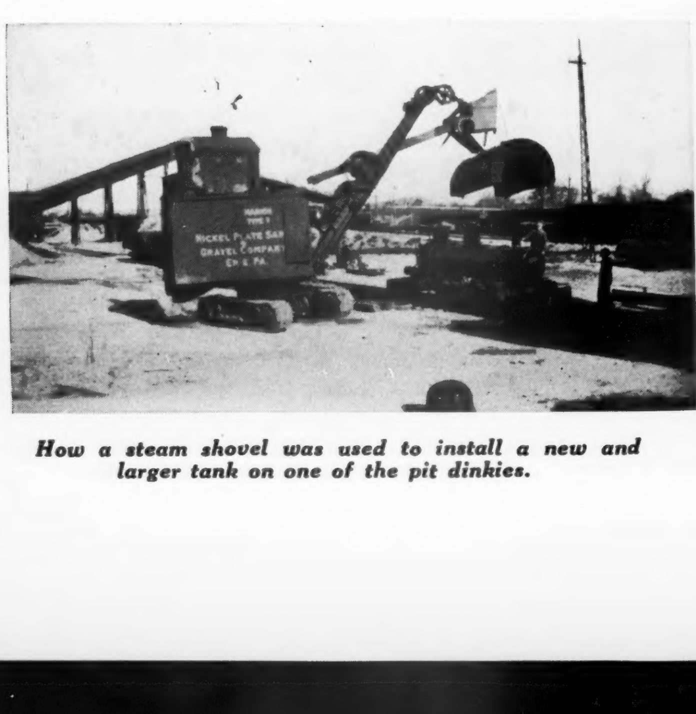
Saving Wear on Rock Chutes

IN rock product and mining operations, ore or rock chutes are frequently made from wooden strips. These are subjected to great wear in service, and some firms make a practice of lining the chutes with manganese steel to prevent abrasion. Linings of this sort are expensive, and although they prevent undue wear for a while, they eventually have to be replaced.

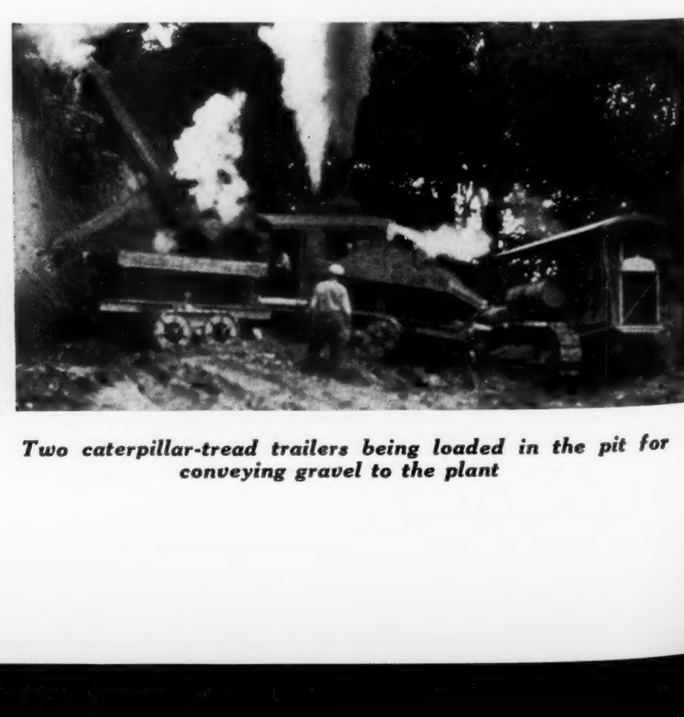
A method for saving the price of these expensive linings has been used in several mining properties. Scrap 2x2-in. angle irons are cut by means of an oxy-acetylene blowpipe into strips equal in length to the width of the bottom of the chute. These strips are fastened across the bottom of the wooden chute by means of wood screws or, if a steel lining has been put in, they are welded in place about 8 in. apart. The result is that the ore or crushed rock fills up the space between the angle irons and gives the chute a bottom surface of rock. This ends the wear on the wooden chutes.—*Oxy-Acetylene Tips.*

Moving Material to the Plant with Caterpillar-Tread Trailers

TRANSPORTATION of material from the pit to the receiving hopper at a sand plant often is a problem which has a number of solutions, any one of which may have distinct advantages. The Canton Sand and Gravel Co., at New Philadelphia, Ohio, has adopted a system which well suits the needs of its operation, and which is interesting because it has not been similarly employed



How a steam shovel was used to install a new and larger tank on one of the pit dinkies.



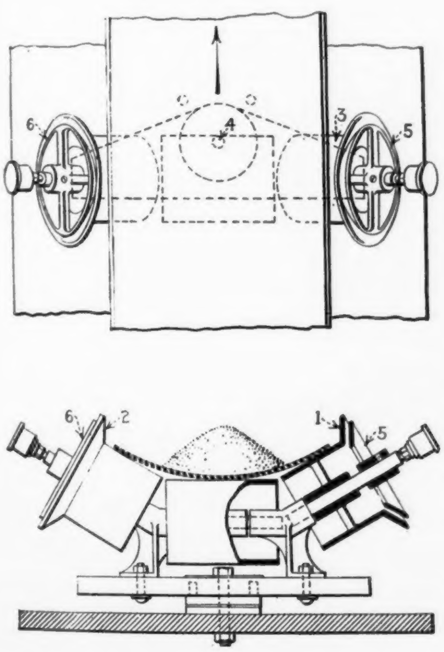
Two caterpillar-tread trailers being loaded in the pit for conveying gravel to the plant

at other plants to any great extent. A pair of "Caterpillar" tractors are used and each pulls two trailer dump wagons which are also on caterpillar treads. The short turning radius of the dump trailers and of the tractors permit ease of operation in the pit in getting in position for loading, which is very necessary at this operation. Constant supply is kept at the plant, since the trailers drawn by one tractor are at the plant dumping while the other trailers are being loaded at the shovel. The soft ground in the pit does not slow up or stop the trailers because of their large size treads.

Self-Aligning Idler for Belt Conveyors

(From Engineering and Mining Journal)

AS a result of unequal loading and other causes, conveyor belts have a tendency to deviate laterally on the idlers supporting the belt, writes Edward Cuddihy, master mechanic at the Tooele Smelter in Utah. To prevent such movement, vertical guide pulleys placed at the edges of the belt have



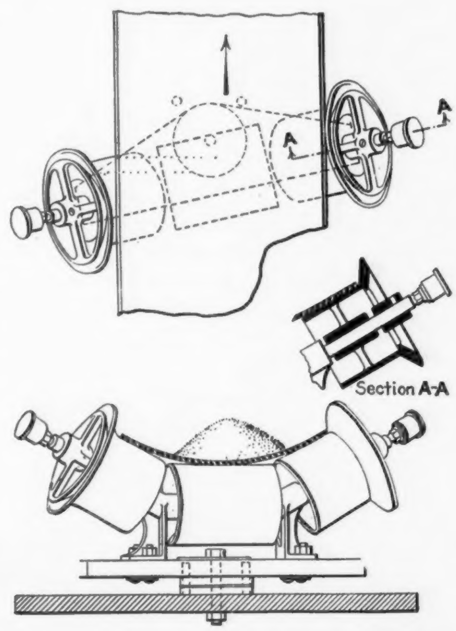
Plan and vertical views of the self-aligning idler in normal position

customarily been used. These do not remove the tendency toward lateral movement, but merely act as stops preventing it, and, as a result of the pressure of the belt against them, the belt is rapidly worn out at the edges.

A troughing idler unit devised to oppose automatically any lateral deviation of the belt, and so pivoted upon a supporting structure that the lateral thrust developed by a shifting of the belt will turn the unit in a position to correct the deviation, is shown herewith.

As shown in the illustration, the idler unit for a belt of given width is so designed that the edges of the belt normally clear the side flanges of both inclined idlers, that is, slight deviations of the belt may occur without bringing the belt into contact with the conical portions 1 and 2. Any substantial deviation of the belt, however, will bring the belt into engagement with one of the flanges, and the idler unit will then function to correct the deviation.

Assuming that the deviation is toward the



Plan and vertical views of the idler in position assumed when correctly lateral deviation of the conveyor belt

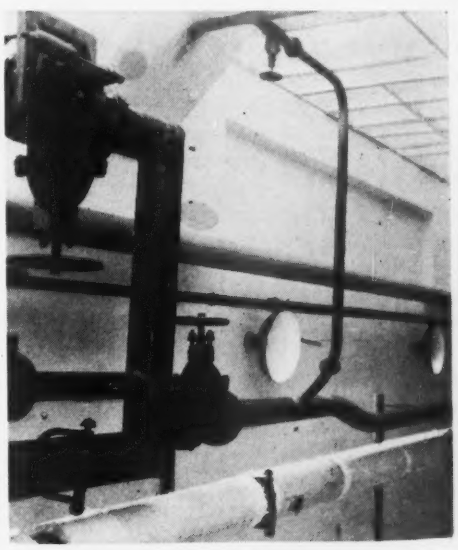
right, the belt engages flange 1 or pulley 3, and this side pressure causes a turning movement about pivot 4, as it is not balanced by any pressure exerted on the opposite pulley. The idler unit will then turn counter-clockwise into the position shown in the second illustration, presenting the axis of the pulleys at an angle to the direction of travel of the belt. The forward movement of the belt will then carry the belt towards the left and correct the deviation.

Except in cases involving a rapid lateral deviation of some magnitude, the brake rings 5 and 6 take no part in the self-aligning operation of the idler unit, as the side pressure on the conical flanges will be sufficient to shift the unit under normal operating conditions. If, however, the lateral deviation is quite rapid and of considerable magnitude, the inclined idler will move upward along its stub to engage the conical flange 1 or 2 with the corresponding brake ring 5 or 6. The friction resistance will then exert a drag on the belt, and the reaction on the pulley will tend to drag the pulley ahead, thus pivoting the unit about the axis 4, and accentuating the angular discrepancy between the axis of the pulleys and the direction of travel of the belt. The turning movement is in the same direction as that exerted by the side pressure of the belt, and its effect is to hasten the return of the belt to its correct path.

As a result of the use of these self-aligning idlers on the belt conveyors at the Tooele plant of the International Smelting Company, the life of the belts has been considerably increased, and vertical guide pulleys have been dispensed with at the edges of the belts. An application has been made for a patent.

The Welded Joint on Industrial Piping

IN construction projects recently placed underway it has been noted that there has been a tendency to use welded pipe connections in place of the older type of fitted pipe connections. This type of joint undoubtedly has several advantages which those in charge of construction and improvements at industrial plants should be quick to see. With the oxwelded joint there is practically no maintenance cost, the connection is leakproof, and, moreover, it will last as long as the pipe itself. Costly fittings are eliminated, and when the company has access to a ready welding outfit, the work of extension as well as original installation can be carried out with quickness and economy. Any special fitting can be fabricated with cutting and welding pipes right on the



A portion of an all-welded piping installation in a large industrial plant

job. No threading of joints is required and cutting is made easier.

One of the chief advantages of the oxwelded construction is that pipe can be purchased in standard lengths of 40 ft. (or whatever is convenient) and there is no necessity for fussing with the purchase of many short and varied lengths. It is also a great help to use oxwelding for extension to previously-existing systems, because of the possibility of doing the job on a moment's notice, and at little cost.

Takes Exception to Conclusions of Report on Crushed Stone Concrete

TO THE EDITOR: Mr. Goldbeck's report on crushed stone research published in the February 2 issue of ROCK PRODUCTS has been read with a great deal of interest, particularly that part showing comparisons of "crushed stone concrete with competing gravel concrete." The comparisons referred to consist of results of compression and flexure tests on concrete made from six different gravels and six different crushed stones.

The writer feels that certain of the conclusions stated or implied in the report are not justified by the test data and wishes to take this opportunity to comment on them.

According to the report, "the gradation of the coarse aggregates was the commercial gradation of these materials as received in the laboratory" and "no attempt whatever was made to make the gradations alike." The report contains no information as to source of the materials, gradings of aggregates, quantity of mixing water or amount of cement per unit of volume of concrete. Only the strengths, a statement of the approximate workability in terms of the slump and flow tests, the proportions of cement, fine and coarse aggregate, and certain information concerning the physical characteristics of the aggregate particles are given. The omitted data are essential to an intelligent analysis of the tests, and it is felt that Mr. Goldbeck has been negligent in not including them.

The test results show higher strengths in both compression and flexure for the crushed stone than for the "competing" gravel, and it is stated that "the present results at least indicate the effects of the various aggregates for the particular conditions of the tests, which are not far from the general average of conditions throughout the country."

To imply that tests carried out on materials for which "no attempt whatever was made to make the gradations alike" give an indication of the comparative merits of two different types of materials does not seem to be in accord with the scientific spirit which should accompany research.

To claim that tests on six samples of gravel and a similar number of crushed stone represent "not far from the general average of conditions throughout the country" seems a somewhat extravagant statement in a country in which there are more than 1500 established and reputable producers of sand and gravel, and probably almost as many of stone.

That these tests do not represent a true comparison of the materials involved seems probable. Differences in grading and differences in cement content caused by the lower void content of the gravel might readily account for most of the differences in strength shown by the tests. Speculation on this point, however, is profitless in the absence of the other data. While it is true that the gradings are said to have represented the "commercial gradation," the well-known difficulty of selecting representative samples leaves this point open to question. No information is given in the report to show how the samples were selected.

As stated previously, a thorough analysis of the tests is impracticable in the absence of the incidental information so important to a complete study of test results. It is understood that a more complete publication of these data will be forthcoming in the near future, and we will reserve any attempt to analyze them until that time.

It would be easy to present tests showing that Mr. Goldbeck's information does not apply to conditions other than the *specific* ones surrounding his tests. However, it is evident that there is neither time nor space in this brief discussion for a complete review of data on the question, and it does not seem desirable to present anything less at this time. STANTON WALKER,

Director, Engineering and Research Division, National Sand and Gravel Association.

Washington, D. C.,
February 28, 1929.

Texas Sand and Gravel Co. Completing New Plant Near Waco

THE Texas Sand and Gravel Co., Waco, Tex., is doubling the capacity of its operation at Texand by the erection of a new plant adjacent to its present plant, which has been in operation for about 10 years. Although the present pit is by no means worked out, new pits will be opened for the new plant, and in the future the two plants will be operated as independent units. The new plant, when completed, will be a duplicate of the present Texand plant, and the combined capacity will be 60 carloads per day. Like other plants of the company, the new plant will be a pumping operation and will use an 8-in. centrifugal pump delivering material to the plant through a 6-in. line.

To avoid the necessity of sending trucks to Texand and other out-lying pits, the Texas company has opened a storage depot in Waco, where a supply will be kept on hand to meet the needs of the city. The same arrangement has been made at Amarillo, Tex., where the company is operating three plants within a radius of 40 miles.

The Texas Sand and Gravel Co. was organized in 1921 with L. D. Eastland as president, T. J. Palm and W. D. Eastland, vice-presidents and Roy P. Eastland, treasurer. The company's annual business volume has expanded to a figure five times as large as it was at first, and the operations have grown from the one pit at Texand (on Lake Eastland) to eight plants serving every section of the state. The new Texand plant is the eighth unit.—*Waco* (Tex.) *News Tribune.*

British Industries Fair Reveals Development of Quarry Plant

DURING the last two years there has been a notable development in the United Kingdom in the manufacture of excavating, crushing and quarrying machinery, with the result that Britain is now not only less dependent on other countries for machines of special type and size, but is also leading the way in meeting the demand for machines and plants of higher tonnage capacity and treatment efficiency. Much of this new plant was on view at the British Industries Fair, which has just concluded a very successful season at Birmingham.

The progress with quarrying, crushing and grading machinery has been largely due to the rapidly growing demand for quarried materials. The crude and inefficient installations of a few years ago, when a road metal quarry was usually equipped with a jaw crusher and a single revolving screen, often obtained second-hand, with little regard to suitability, are being superseded by plants not only of far greater capacity, but also equipped with machinery for crushing by stages and with screening appliances for producing a variety of closely graduated sizes to meet the more varied demands of present-day road construction.

In this development of the modern stone-crushing plant the more scientific methods adopted in preparing metalliferous ores for concentration are being followed. Consequently mining machinery is being increasingly introduced in quarry plants, stage crushing and closely graduated sizes of the ore being both necessary in ore mining as a preliminary to efficient ore concentration. Crushers and screens for this purpose have been developed to a point which gives a ready opportunity for their application to the requirements of the modern quarry plant. For the finer grinding of rock materials, in a dry state, down to the degree of fineness required for their use as a "filler" in rubber and for many other purposes the air-swept ball mill has been developed together with an efficient system of air separation, in closed circuit, which, while separating out the material of finished fineness, automatically returns to the mill for regrinding the oversize or insufficiently ground material.

Marquette Cement Completes New Unit at Oglesby, Ill., Plant

ESTABLISHING what is said to be a record performance for construction work of that nature, the Marquette Cement Manufacturing Co. opened its new two million barrel unit at Oglesby, Ill., last month. Foundations were started on this unit the first of last September, and from then on the work was rushed through to completion. This unit adjoins the Marquette company's No. 1 plant, and gives the concern an annual output of five million barrels at this location. —*Princeton* (Ill.) *Record.*

Editorial Comment

Comparisons Are Odious

One quite generally recognized rule of business ethics—but one quite generally violated—is not to knock a competitor, or a competitor's product—particularly if the competitor's product is of the same general character as your own. Common-sense reasons for this rule are many, including: (1) It is negative salesmanship; (2) you arouse sympathy in your prospect for your competitor, or his material; (3) you show your prospect *fear* of your competitor, or his product; (4) you arouse suspicion in his mind regarding the shortcomings of the material in question generally. On the other hand, if you attempt to extend on the virtues of your own product, how can you do so effectively without comparisons? And comparisons are odious, odorous, and making them is knocking your competitor by inference. Hence it is a very difficult rule to live up to.

A particular example of such a comparison which is now arousing considerable ire in the sand and gravel industry is the comparison of "crushed-stone concrete with competing gravel concrete" for pavement construction, made in a paper read by A. T. Goldbeck at the recent annual convention of the National Crushed Stone Association.

The crux of the situation is this; and no one has anything to gain by not recognizing it in the open: Crushed stone is much more expensive to prepare than gravel; it cannot compete with gravel on an equal price footing, but only where freight rates are exceptionally favorable. Since on most concrete jobs there must be a price differential, the price differential must be justified by the superior virtue of the material adopted at the higher price.

Mr. Goldbeck sincerely believes that there is a difference in the quality of concrete—the flexural strengths at least—in some several instances where he has made comparative tests. The United States Bureau of Public Roads and other authorities have come to similar conclusions in similar specific instances.

In these results, if the tests are fair, we see nothing to cause excitement or resentment from either party to the controversy. In each case the tests, as we understand them, are of specific crushed-stone samples compared with specific gravel samples from specific localities. Without question equal differences in the quality of the concrete could be shown between other specific samples of gravel compared with the gravel used, or specific samples of crushed stone compared with other crushed stone under like conditions; certainly so if gravels and crushed stones in other parts of the country than those from which these particular samples came were taken into consideration.

We do not believe that either Mr. Goldbeck or the Bureau of Public Roads expects to prove that *all* crushed-stone concrete is superior to *all* gravel concrete; nor has any crushed-stone or gravel producer the right, from results thus far published, to conclude that his particular material is inherently better or worse than his competitor's.

We think that the comparison of any two or more aggregates proposed for use on any particular job should be made to determine the ultimate economy of their use on that particular job, whether that comparison is made between crushed stone and gravel, or between two crushed stones, or between two gravels. There would be no incentive to the production of quality aggregates if this were not to be the case, eventually, if not now. Certainly to the forward-looking, honest, progressive producer competition on such a basis is far preferable to price-cutting or wire-pulling.

But in all such discussions the producer must ever bear in mind that the ability to give compressive strength or flexural strength in concrete are only one or two virtues desirable in concrete-making materials; others equally important to the economy of concrete construction are the workability of the mix, the gradation of the aggregates, etc., etc. As we have said in these columns several times before, the aggregate which combines all these virtues has not yet been produced, nor do we expect to see it on the market soon.

Every producer, who sees clearly this real issue—the production of more and better concrete of the greatest ultimate economy for the particular job—has no legitimate quarrel with sincere and honest effort to provide scientific data for engineers to base economic judgment on. Their only real grievance can be against the abuse of such data to include interpretations not at all justified by the data themselves. Also, of course, producers have always the right to question the authenticity of the data, or the character of the tests from which they were derived. Scientific truths are never established without the most searching criticism; and intelligent criticism is constructive and always welcomed by scientific men.

Again we reiterate our firm belief that however disturbing such reports as Mr. Goldbeck's may be at the moment, that we are all slowly, but surely approaching a period of competition where ultimate engineering economy will be the objective of all concerned, the producer as well as the user; and that when competition is finally resolved on that basis there will be mighty little relative change in the estimation of engineer users as to the respective virtues of gravel and crushed stone.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	3-14-29	91	93	
Alpha P. C. new com.	3-11-29	50	53	75c qu. Apr. 15
Alpha P. C. pfd.[2]	3-11-29	116	....	1.75 Mar. 15
American Aggregates com.	3-13-29	48	50	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	3-13-29	112	113	
American Brick Co.	3- 8-29	17½	....	25c qu. Feb. 1
American Brick Co. pfd.	1-14-29	89	94	50c qu. Feb. 1
Am. L. & S. 1st 7's[29]	3-14-29	101	102	
American Silica Corp. 6½'s	3-13-29	96	100	
Arundel Corp. new com.	3-12-29	40¾	41	50c qu. Jan. 2
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	3-13-29	No market		
Atlas P. C. com.	3-11-29	47	51	
Atlas P. C. pfd.	3-11-29	50	....	66⅔c qu. Apr. 1
Beaver P. C. 1st 7's[20]	3- 7-29	99	100	
Bessemer L. & C. Class A[4]	3-12-29	35¾	37½	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'s[4]	3- 8-29	99¾	100½	
Bloomington Limestone 6's[29]	3-14-29	91	93	
Boston S. & G. new com.[16]	3-11-29	20	23	
Boston S. & G. new 7% pfd.[16]	3-11-29	50	52	
Canada Cem. com.[43]	3-11-29	32½	33	
Canada Cem. pfd.[43]	3-11-29	98	98¼	1.62½ qu. Mar. 30
Canada Cement 5½'s	3- 8-29	99½	100½	
Canada Cr. St. Corp. 1st 6½'s.	3- 8-29	95	98	
Canada Gyp. & Alabastine	3-11-29	107	108	75c Jan. 2
Certainteed Prod. com.	3-12-29	22	23	
Certainteed Prod. pfd.	3-12-29	56	58	1.75 qu. Jan. 1
Cleveland Stone new st'k	3-12-29	61	75	50c qu. 25c ex. Mar. 1
Columbia S. & G. pfd.	3-11-29	93½	94½	
Consol. Cement 1st 6½'s, A[42]	3-13-29	92	96	
Consol. Cement 6½% notes	3-13-29	90	95	
Consol. Cement pfd.[29]	3-14-29	50	60	
Consol. S. & G. com. (Canada)	3-11-29	17	....	
Consol. S. & G. pfd. (Canada)	3-11-29	90	93	
Construction Mat. com.	3-12-29	31½	32½	
Construction Mat. pfd.	3-12-29	48	48½	
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	3- 7-29	98	99½	
Coosa P. C. 1st 6's[29]	3-14-29	50	55	
Coplay Cem. Mfg. 1st 6's[40]	3-11-29	90	....	
Coplay Cem. Mfg. com.[40]	3-11-29	15	....	
Coplay Cem. Mfg. pfd.[40]	3-11-29	75	....	
Dewey P. C. 6's[30]	3-13-29	99	....	
Dolese & Shepard[7]	3-12-29	110	115	$2 qu. Apr. 1
Edison P. C. com.[19]	3-11-29	50c	....	
Edison P. C. pfd.[19]	3-11-29	1	....	
Edison P. C. bonds[19]	3-11-29	75	....	
Giant P. C. com.	3- 8-29	36	40	
Giant P. C. pfd.	3- 8-29	38	42	
Ideal Cement, new com.	3-12-29	79	81	75c qu. Jan. 2 & 50c ex. Dec. 22
Ideal Cement 5's, 1943	3- 9-29	106	108	
Indiana Limestone units	3-14-29	4	....	
Indiana Limestone 6's	3-11-29	90½	....	
International Cem. com.	3-12-29	93½	94	$1 qu. Mar. 28
International Cem. bonds 5's	3-12-29	107¼	108½	Semi-ann. int.
Iron City S. & G. bonds 6's[40]	2- 9-29	95	99	
Kelley Is. L. & T. new st'k	3-12-29	58½	60	62½c qu. & 50c ex. Jan. 2
Ky. Cons. Stone Co. com.[48]	3- 7-29	13	15	
Ky. Cons. St. com. Voting Trust Certif.[48]	3- 7-29	13	15	
Ky. Cons. Stone 6½'s*[48]	3- 7-29	96	100	
Ky. Cons. St. Trustee Certif.[48] (1 Sh. 7% cum. pfd. & 1 sh. com. stock)	3- 7-29	98¼	100	
Keystone Sand & Sup. 6's[47]	8-22-28	99	100	
Lawrence P. C.[3]	3-11-29	95	100	
Lawrence P. C. 5½'s, 1942	3- 6-29	95	....	
Lehigh P. C.[3]	3-12-29	58	58½	62½c qu. May 1
Lehigh P. C. pfd.[2]	3-12-29	110	111	1¾% qu. Apr. 1
Lyman-Richey 1st 6's, 1932[13]	3-11-29	98	100	
Lyman-Richey 1st 6's, 1935[13]	3-11-29	97	99	
Marblehead Lime 6's[14]	3- 9-29	98	100	
Material Service Corp.	3-14-29	37	39	50c qu. Mar. 1
Mich. L. & C. com.[6]	2-25-29	35	....	
Missouri P. C.	3-12-29	46¾	47½	50c qu. Feb. 1
Monolith Midwest[9]	3- 7-29	8	10	
Monolith P. C. com.[9]	3- 7-29	15¼	16	8% ann. Jan. 2
Monolith P. C. pfd.[9]	3- 7-29	8¾	9¼	
Monolith P. C. units[9]	3- 7-29	32¾	34½	
Monolith bonds, 6's	3- 8-29	97	98	
National Cem. (Can.) 1st 7's[38]	3-11-29	99	101	
National Gypsum A com.	3-12-29	13	15	
National Gypsum pfd.[35]	3-12-29	48	52	
Nazareth Cem. com.	3- 8-29	27	30	
Nazareth Cem. pfd.	3- 8-29	100	105	
Newaygo P. C. 1st 6½'s[29]	3-14-29	102½	....	
New Eng. Lime 1st 6's[14]	3- 9-29	98	100	
N. Y. Trap Rock 1st 6's	3-12-29	100	....	
North Amer. Cem. 1st 6½'s	3-11-29	71⅝	....	
North Amer. Cem. com.	3-14-29	9	11	
North Amer. Cem. 7% pfd.	3-14-29	30	36	
North Amer. Cem. units	3-14-29	35	39	
North Shore Mat. 1st 5's[15]	3-13-29	97½	....	
Northwestern States P. C.[37]	3- 9-29	195	205	
Ohio River S. & G. 6's	3- 9-29	92	96	
Pac. Coast Cem. 6's, A	3- 7-29	93	96	
Pacific P. C. com.	3- 8-29	30	34	
Pacific . P. C. pfd.	3- 8-29	82½	....	1.62½ qu. Jan. 5
Pacific P. C. 6's	3- 7-29	98¾	100	
Peerless Egyp'n P. C. com.[21]	3-11-29	2⅝	3	
Peerless Egyp'n P. C. pfd.[21]	3-11-29	85	90	
Penn-Dixie Cem. 1st 6's[29]	3-14-29	92	92½	
Penn-Dixie Cem. pfd.[28]	3-12-29	87	88½	1.75 qu. Mar. 15
Penn-Dixie Cem. com.	3-12-29	20¼	20½	
Penn. Glass Sand Corp. 1st 6's. 1952	3- 6-29	103	104	
Penn. Glass Sand pfd.	3- 6-29	112	....	
Petoskey P. C.	3-12-29	10¼	10¾	1½% qu.
Riverside P. C. com.	3- 8-29	20	....	
Riverside P. C. pfd	3- 7-29	20	22½	
Riverside P. C., A	3- 7-29	18	21	
Riverside P. C. B	3- 7-29	1	2	
Sandusky Cem.	3-12-29	260	275	$2 qu. Jan. 1 & $4 extra
Santa Cruz P. C. bonds	3- 8-29	105¾	....	6% annual
Santa Cruz P. C. com.	3- 8-29	92	....	$1 qu. Jan. 1 & $2 ex. Dec. 24
Schumacher Wallboard com.	3- 8-29	16½	17	
Schumacher Wallboard pfd.	3- 8-29	24	24¾	
Southwestern P. C. units[44]	3- 9-29	270	....	
Superior P. C., A[20]	3- 8-29	47	48	27½c mo. Mar. 1
Superior P. C., B[28]	3- 8-29	30	31½	
Trinity P. C. units[37]	3- 9-29	156	163	
Trinity P. C. com.[37]	3- 9-29	50	....	
U. S. Gypsum com.	3-12-29	....	61	2% qu. Mar. 31
U. S. Gypsum pt. paid	3-12-29	45	46	
U. S. Gypsum pfd.	3-14-29	125	127	1¾% qu. Mar. 31
Universal G. & L. com.[3]	3-13-29	....	50c	
Universal G. & L. pfd.[8]	3-13-29	5	10	
Universal G. & L., V.T.C.	3-13-29	No market		
Universal G. & L. 1st 6's[3]	3-13-29	50	60	
Chas. Warner com.	3-11-29	39	43	50c. qu. Jan. 12 & 50c extra
Chas. Warner pfd.	3-11-29	109	....	1¾% qu. Jan. 24
Chas. Warner rts.	3-11-29	25c	50c	
Whitehall Cem. Mfg. com.[36]	1-30-29	150	....	
Whitehall Cem. Mfg. pfd.[36]	1-30-29	98	....	
Wisconsin L. & C. 1st 6's[15]	3-13-29	98	....	
Wolverine P. C. com.	3-12-29	6⅛	6½	15c qu. Feb. 15
Yosemite P. C., A com.[20]	3- 7-29	6	7	

*Ann. interest due May 1 and Nov. 1. Semi-ann. coupon of $32.50 paid Nov. 1.

[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach & Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White & Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter & Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney Williams & Co., Inc., Los Angeles, Calif. [46]Stein Bros. & Boyce. Baltimore, Md. [47]Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd. (sand-lime brick) 16 sh.[6]	par 25	25¾
Benedict Stone Corp. 1st 7's 1934[8]	....	86
International Portland Cement Co., Ltd., pfd.	30	45
Knickerbocker Lime Co.[4]	105	....
River Road Sand and Gravel Co.,[9] 200 shares	$21 per share	....
River Road Sand and Gravel Co.,[11] 219 shares	$55 per share	....
Seaboard P. C.[1] 6% bonds ($7,500) 7-1-27. July, 1910, and subsequent coupons attached	$10 for the lot	....
Southern Phosphate Co.[6]	1¼	....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	....
Universal Gypsum com.[1] 153 shares (no par)	$51 for the lot	....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	....
Winchester Brick Co., pfd., sand lime brick[5]	10c	....
Winchester Rock Brick Co. pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	....
Winchester Brick Co. pfd.[10] 250 sh. (par $10)	$100 for the lot	....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price at auction by R. L. Day & Co., December 26, 1928. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L Day & Co., Boston, Mass. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [8]Auction sales of $1000, Barnes Barnes & Lofland, Sept. 26, 1928. [10]Price at auction Dec. 19, 1928, R. L.

International Cement Income and Balance Sheet

THE PAMPHLET REPORT of the International Cement Corp., for the year ended December 31, 1928, shows consolidated net income of $5,149,388 after depreciation, depletion and federal income taxes, equal after 7% cumulative preferred dividends (preferred stock called for retirement on May 20, 1928,) to $7.90 a share on the 618,826 no par common shares outstanding. This compares with $4,554,172 or $6.90 a share on the 562,500 common shares outstanding at the close of the 1927 year.

Consolidated income account for the year ended December 31, 1928, compares:

	1928	1927	1926
Sales	$27,596,096	$23,671,138	$21,623,581
Manufacturing and shipping costs	15,790,101	13,788,768	12,253,363
Depreciation and depletion	2,442,300	1,967,819	1,724,151
Manufacturing profits	$ 9,362,695	$ 7,914,551	$ 7,646,062
General expenses	3,222,216	2,800,638	2,618,452
Net operating profits	$ 6,140,479	$ 5,113,913	$ 5,027,610
Miscellaneous incidentals	436,014	306,946	208,609
Total income	$ 6,576,493	$ 5,420,859	$ 5,236,219
Income tax and charges	1,427,105	866,687	881,020
Net income	$ 5,149,388	$ 4,554,172	$ 4,355,199
Preferred dividends	256,377	671,189	685,758
Common dividends	2,418,978	2,250,000	2,125,000
Surplus	$ 2,474,033	$ 1,632,983	$ 1,544,441

Consolidated balance sheet as of December 31, 1928, showed current assets of $10,069,094 compared with $6,626,757 as of December 31, 1927; current liabilities $2,057,851 against $2,354,055, leaving net working capital of $8,011,243 as compared with $4,272,702.

ASSETS

	1928	1927	1926
Cash	$ 2,387,788	$ 488,083	$ 1,190,346
Marketable securities	8,042	25,994	24,237
Accounts payable	1,091,542	1,321,373	1,033,530
Sundry accounts	108,021	53,819	214,419
Notes receivable, etc.	120,569	93,823	278,732
Less doubtful accounts	68,418	121,932	132,286
Inventories	5,457,213	4,374,999	4,209,561
Less reserves	....	....	46,154
Net current assets	10,069,094	6,626,757	7,395,002
Deferred charges	1,723,931	267,534	333,936
*Plant and equipment	42,018,592	33,632,657	30,712,183
Total	$53,811,616	$40,526,949	$38,441,120

LIABILITIES

	1928	1927	1926
Accounts payable	$ 1,091,542	$ 1,321,373	$ 1,033,530
Notes payable	....	200,000	....
Accrued interest and expenses	497,437	263,183	216,949
Incorporation tax provisions	468,871	569,499	568,320
Employes' stock subscriptions	559,616	378,635	229,065
Funded debt	18,000,000	....	....
Surplus subsidiary companies	108,033	81,995	99,394
Subsidiary companies' stocks not owned	110,451	140,586	165,397
Preferred stock	....	9,549,800	9,694,400
Common stock	20,993,181	18,482,636	18,593,694
Earned surplus	11,982,485	9,539,240	7,840,371
Total	$53,811,616	$40,526,949	$38,441,120

*Less depreciation and depletion reserves, etc.

Construction Materials Corporation Stock Offering

A. G. BECKER AND CO., Chicago, Ill., are offering 75,000 units consisting of one share of convertible preference stock and six-tenths of a share of common stock in the Construction Materials Corp., sand and gravel producer, Chicago, Ill. A letter signed by J. R. Sensibar, president of the company, contains the following data:

HISTORY AND BUSINESS—The Construction Materials Corp., a Delaware corporation, has been organized to take over the business of an Indiana corporation of similar name engaged in the recovery, transportation and distribution of sand and gravel for building construction, road building, street paving, water front improvement and harbor developments, and for use by railroads and foundries. The company has the only large commercial deposit of high grade gravel with an all-water haul to its principal markets in the Great Lakes region. Since transportation costs are extremely important in this business, the company has distinct competitive advantages.

The Construction Materials Corp. is the largest producer of sand on the Great Lakes and is therefore a very important factor in the program of reclaiming low-lying or submerged water front properties through the sand fill method. The development of special machinery and methods of handling and transporting have given the company distinct competitive advantages in this type of work.

The company is acquiring at this time the road building, asphalt and construction business of R. F. Conway Co. In order to retain the good-will built up by the very successful Conway company in 56 years of operation in Chicago, the Conway business will be operated by a wholly owned subsidiary under the old name and management. The company thus acquires an old, well established business whose operations have been very profitable and which uses from $700,000 to $1,000,000 of sand, gravel and other construction materials annually.

The business has grown in 22 years from an investment of $100 to a net worth of $5,546,000, as shown by the accompanying balance sheet as of December 31, 1928, giving effect to the transactions incident to this financing. In 1906 the business consisted of a bank sand pit, loading by wheelbarrow and shipping 250 tons, or eight carloads of sand, daily. Today it is an industry with a daily capacity of over 18,000 tons of sand and gravel, which it excavates, loads and unloads mechanically and transports, principally by water, in its own equipment.

PROPERTY AND METHODS OF OPERATION—The company's gravel deposits at Bass River, Mich., according to the reports of competent engineers, are estimated to contain over 40,000,000 tons. The material runs in proportions of approximately 60% gravel (over ¼ in.) to 40% torpedo sand (below ¼ in.), which are approximately the proportions required in the manufacture of concrete, minimizing the surplus sand problem common with other gravel deposits. It is used as standard material by the Michigan state highway commission, the United States engineers, and many municipalities and builders.

Through this financing the company will complete its new plant, now partly in operation, at Ferrysburg, Mich., on Grand Haven harbor, a few miles below the Bass River gravel and torpedo sand deposit. This plant will be equipped to wash and screen five standard sizes of this material and as many special sizes as may be required, to be brought by water from the deposit. It will also provide storage facilities for over 300,000 tons and will be equipped to load this material by mechanical means directly into vessels, cars and trucks at the rate of over 2000 tons per hour. This plant should when fully completed be able to handle up to 2,000,000 tons of sand and gravel annually. It is expected that this unit will be in full production by the last half of 1929.

The company, through a wholly-owned subsidiary, owns and operates on leased land two plants producing bank and core sand at Miller and Gary, Ind. However, it obtains over 80% of its sand from the bed of the Great Lakes by means of its two modern self-propelled, self-loading and unloading steel vessels, the *Sandmaster* and *Sandcraft.* These ships are used not only in constructing sand fills but also in keeping supplied with sand the company's storage and distributing docks centrally located in Chicago on the Chicago and Calumet rivers, at Muskegon, Mich., and Ferrysburg, Mich.

In order to take advantage of the demand for sand fills in connection with water front development, we originated a method of hydraulically loading sand from the bed of the Great Lakes into floating equipment which transports the load under its own power to the point of the fill and then discharges it hydraulically through pipe lines to finished contours at any distance up to 8000 feet from shipside. The company's Diesel electric seagoing hopper dredge *Sandmaster* and steam seagoing hopper dredge *Sandcraft,* which do this work, are equipped to operate anywhere on the Great Lakes or on salt water.

Our original methods of handling sand, protected by patents, have enabled us to make important sand fills for the Field Museum of Natural History, Chicago; the South Park Commissioners, Chicago; the city of Chicago; Johns-Manville Co., Waukegon, Ill.; Continental Motors Corp., Muskegon, Mich.; Youngstown Sheet and Tube Co., Indiana Harbor, Ind.; Terminals and Transportation Corp. of America, Buffalo, N. Y.; Standard Oil Co. of Indiana, at Muskegon, Mich., and others. This type of work should offer an important and profit-

able field for our activities for many years to come in serving both corporations and municipalities. One of the most extensive municipal improvements is the South Park lake front development in the city of Chicago, which requires the reclamation of very large areas of submerged land along the lake shore between Grant Park and South Chicago, a district of over 12 miles. It is estimated that this project alone will probably require 40,000,000 cu. yd. of material, which at the present rate of production it will take many years to supply.

EARNINGS—The sand and gravel units together have shown uninterrupted profits since the business was incorporated 18 years ago, and the operations of the business, as now constituted, have shown a profit throughout the 18 years with the single exception of 1919.

The following condensed statement, prepared by independent auditors, shows combined net income of the two companies for the past three years after adjustments for non-recurring income and charges, after adjusting depreciation charges of the sand and gravel equipment on basis of rates recommended by Ford, Bacon and Davis and after federal income taxes at 12% in lieu of those actually paid:

Years ended Dec. 31	Income as above	Earned per share preference stock	Earned per share common
1926	$ 478,740	$ 6.38	$1.17
1927	854,755	11.40	3.20
1928	1,005,759	13.41	4.02

ASSETS—The pro forma consolidated balance sheet of the Construction Materials Corp. as of December 31, 1928, as certified by Ernst and Ernst, giving effect to (*a*) an appraisal of fixed assets by the American Appraisal Co. as of October 31, 1928, (*b*) to the acquisition of the fixed assets and good-will of the R. F. Conway Co., (*c*) the reduction of the good-will item of $1, and (*d*) to this financing, showed net assets of $5,546,355, equivalent to $73.95 per convertible preference share to be outstanding presently, and current asset of $1,689,005 against current labilities of $258,034, a ratio of 6½ to 1.

PURPOSE OF FINANCING—The purpose of this financing is to retire funded debt and preferred stock of the predecessor company now outstanding, to provide additional working capital and funds for the completion of the Ferrysburg plant and the acquisition of the real estate, plant and equipment of R. F. Conway Co.

CAPITALIZATION—The capitalization of the Construction Materials Corp., upon completion of this financing, will be as follows:

	Authorized	Presently to be outstanding
Convertible preference stock (no par value), shares	75,000	75,000
Common stock (no par), shs.	300,000*	185,000

*75,000 shares reserved for conversion of preference stock and 40,000 shares reserved against option to the management for a period of five years at $50 per share with further extensions of the option under certain specified conditions.

CONVERTIBLE PREFERENCE STOCK PROVISIONS—The convertible preference stock may be converted into common stock of the company, share for share, at the option of the holder at any time. In the event that this stock is called for redemption it may be converted at any time prior to five days preceding the call date.

The convertible preference stock will be preferred as to quarterly cumulative dividends at the rate of $3.50 per annum and as to assets up to $60 per share in the event of liquidation. It will be redeemable at the option of the company at any time upon 60 days' notice at $60 per share and all accrued unpaid dividends. It will have equal voting rights, share for share, with the common stock, and in the event dividends are in arrears for a total of one year, it shall be entitled to elect a majority of the board of directors until all arrears shall have been paid. If the holders of 25% or more of the convertible preference stock then outstanding shall object thereto in person or by proxy, the company shall not (*a*) issue any stock having any preference or priority over or equality with the convertible preference stock, or (*b*) place a mortgage, lien or encumbrance by guarantee or otherwise upon any of the assets of the company or its subsidiaries, or (*c*) create any funded debt maturing more than 12 months from the date thereof. The latter restrictions shall not apply to the giving or assuming by the company or its subsidiaries of mortgages upon property hereafter acquired to provide funds for any part of the purchase price thereof not exceeding fair value, or for cost of improvements on property owned or acquired, not to exceed the cost or fair value thereof, whichever is lower, or to the pledging of contracts, receivables, merchandise or other liquid assets or shares of stock (other than of subsidiaries) as security for loans maturing in not more than 12 months, or to the borrowing of money for any length of time, when secured by pledge of bonds or other securities.

GENERAL—The public offering of this stock involves no change in the management or control of the business. The men who have been responsible for its successful operation over a long period of years, and who have for the most part grown up in the business, will continue in active management and will control, directly or indirectly, a majority of the common stock of the Construction Materials Corp.

PRO FORMA CONSOLIDATED BALANCE SHEET, CONSTRUCTION MATERIALS CORPORATION

(A Delaware Corp.), Chicago, Ill.

As of the close of business December 31, 1928

(Giving effect, as of that date, to the recapitalization of the company and transactions outlined in the certificate below)

ASSETS

Current:	
Cash (including $231,804.63 previously held for construction)	$ 761,203.66
Notes receivable	11,132.50
Accounts receivable, less reserve	550,792.63
Inventories—per book records, as certified by management:	
Sand and gravel on hand	349,937.29
Cash surrender value of life insurance	15,939.75
	$1,689,005.83
Permanent:	
Land, buildings, equipment, etc., at net sound values* as appraised by the American Appraisal Co. as of October 31, 1928, plus subsequent additions at cost and less depreciation to December 31, 1928	$2,697,342.44
Vessels, at net sound values—as appraised by H. N. Herriman as of December 31, 1926, plus subsequent additions at cost and less depreciation to December 31, 1928	1,199,043.19
	$3,896,385.63
Other assets:	
Including advances to other companies	140,406.24
Deferred	78,591.27
Good-will	1.00
	$5,804,389.97

LIABILITIES

Current:	
Accounts payable	$ 196,608.51
Accrued	8,016.11
Reserve for estimated federal tax	31,409.70
Reserve for estimated winter charges	22,000.00
	$ 258,034.32
Net worth—Represented by:	
75,000 shares of $3.50 cumulative dividend convertible no par preference stock convertible into no par common stock share for share. Callable and redeemable at $60 per share.	
185,000 shares of no par common stock, authorized 300,000 shares. Reserved for conversion 75,000 shares. Reserved on employment contract for five-year period 40,000 shares to be sold at $50 per share.	$5,546,355.65
	$5,804,389.97

*Includes $800,000 prospective value of Bass River gravel deposit when and as production and sale of 1,000,000 tons per annum of its product is realized. In the opinion of the management, the capacity of the company's plant will be approximately 2,000,000 tons a year.

Consolidated Rock Products Co.

PRELIMINARY CONSOLIDATED BALANCE SHEET, December 31, 1928, giving effect to: (1) The formation of the corporation; (2) its acquisition of all of the capital stock of Union Rock Co., Consumers Rock and Gravel Co., Inc., and Reliance Rock Co. for 280,000 shares of preferred stock and 396,000 shares of common stock; (3) the sale of 20,000 shares of preferred stock for $500,000 cash, and (4) the appraised value of land, leases and rock deposits.

ASSETS

Land, leases and rock deposits (based on appraisals reported by the J. G. White Engineering Corp.)		$ 9,931,700.00
Buildings, machinery and equipment (appraised value $6,731,300.00)		4,563,815.80
Deposits with trustees, etc.		50,000.00
Investments in affiliated companies		352,491.56
Securities owned		76,463.49
Current assets:		
Cash	$914,972.55	
Notes and accounts receivable	894,856.57	
Inventories (not verified under audit)	168,578.77	
Total current assets		1,978,407.89
Deferred charges		417,502.62
Total		$17,370,381.36

LIABILITIES

First mortgage, 6%, sinking fund gold bonds		$ 3,895,000.00
Purchase money obligations (due subsequent to January 1, 1930)		359,985.10
Current liabilities:		
Notes payable to banks	$125,000.00	
Purchase money obligation (due in 1929)	366,581.87	
Accounts payable	475,405.29	
Accrued interest	55,060.77	
Total current liabilities		1,022,047.93
Reserve for collisions		17,341.07
Capital stock and surplus (represented by 300,000 shares of preferred stock and 396,000 shares of common stock, both without par value		12,076,007.26
Total		$17,370,381.36

Recent Dividends Announced

American Aggregates com. (quar.) .... 75c, Mar. 1
American Aggregates pfd. (quar.) .... 1¾%, Apr. 18
Atlas P. C. pfd. (quar.) .... 66⅔c, Apr. 1
Canada Cement pfd. (quar.) .. 1.62½, Mar. 30
Kentucky Rock Asphalt com. (quar.) .... 40c, Apr. 1
Kentucky Rock Asphalt com. (spec. stock div.) .... 5%, Apr. 15
Lehigh Portland Cement (quar.) .... 62½c, May 1

Columbia Silica Co. Starts Reconstruction

F. E. HOLCOMB, vice-president and general manager, the Columbia Silica Co., Akron, Ohio, informs ROCK PRODUCTS that the fire which destroyed the company's property, as noted in ROCK PRODUCTS, March 2, while causing a heavy loss, fortunately caused no injuries to employes, although the plant was in full operation at the time.

Contracts have been completed for new buildings, which will be steel throughout, and new equipment and machinery have already been shipped for the new plant. This new equipment includes a complete new screening layout, conveyors, elevators, dust arrester system, motors, rope drives, etc. The new equipment will double the capacity of the plant destroyed, and provision has been made to triple former capacity when it becomes necessary. The new washing plant will be in operation March 25 and the whole plant by April 15, according to present plans.

Texas Highway Engineer Has Courage to Oppose State Cement Plant

A SURVEY, frankly questioning the advisability of the state's attempting to manufacture cement, was filed by the highway commission with the Texas state senate recently. The survey was made by Gibb Gilchrist, highway engineer, and a letter, signed by Commissioner Cone Johnson of the commission said "the commission does not adopt every statement and conclusion" made by the engineer.

The report said growing competition of foreign manufacturers, and the lessening use of cement in road building are factors that will keep the prices down from privately-owned plants. He said the minimum requirements for the state to enter the business would be three plants, each costing $1,942,132, each capable of making 2000 bbl. of cement a day. In the three plants only about 200 convicts could be used, other employes required to be experts, Mr. Gilchrist reported.

The cost of manufacture in Texas was estimated at $1.52 per bbl.

There is now being manufactured 7,700,000 bbl. of cement in Texas per year, and plants for an additional 2,750,000 bbl. are being constructed.

"A state enterprise can not as a rule be operated as cheaply as private plants," the report said. "It is not certain the state can manufacture cement in competition with private plants, even with the elimination of profit."

The question of economical acquisition of cement can be met in other ways than manufacture, Mr. Gilchrist suggested He said use of cement can be curtailed, the highway department can keep a check on costs to determine when they run above a reasonable price level, and that foreign cement, now offered by Belgium and France, will serve as a factor of safety if Texas prices were to go above a reasonable basis.

The cost of concrete highway was $2.21 per sq. yd. in 1925-1926, but was lowered, through improved processes to $2.05 per sq. yd. in 1928, Mr. Gilchrist reported.—*Austin* (Tex.) *American*.

Sand and Gravel Producer Made Assistant Secretary of Navy

ERNEST LEE JAHNCKE whom President Hoover has appointed assistant secretary of the navy, is known to the sand and gravel industry as the president of the Jahncke Service Co., New Orleans, La. He is also president of the Jahncke Dry Dock Co., is an engineer and a lieutenant commander in the naval reserve. Ernest Lee Jahncke is an older brother of Walter Jahncke, so well-known and so popular in the National Sand and Gravel Association and the National Builders Supply Association.

Wisconsin Mineral Aggregate Association Gives Up the Ghost

AFTER SEVERAL YEARS of very successful operation, during which it has been held up to the mineral aggregate industry as a shining example of harmony among competitors, the Wisconsin Mineral Aggregate Association has practically disbanded, effective April 1 (that of all days!). Theoretically, we understand, the association has not disbanded, but merely will discontinue all active work with a paid secretary, and will have no office. Actually, of course, this amounts to dissolution of the association, at least for the present

Discussion at the meeting of the association, at which this action was taken, we understand, brought out the fact that the association's work has been of exceptional value to its members since its inception in 1918, and a number of members very much regretted the disbanding of the organization as an active factor in the industry. The records of the association will be moved to the offices of the Wisconsin Sand and Gravel Co., Milwaukee, for safe keeping.

Thus ends the first, and for a long time successful, attempt to get producers of sand, gravel and stone to work together in the same organization. In fairness to the Wisconsin association it should be said that the disbandment is not due, so far as we know, to any disagreement between gravel and crushed-stone producers, but to very unsatisfactory conditions generally, brought about largely by county operation of gravel plants and to a host of roadside, temporary operators, who received encouragement from the state and county highway authorities, to the great detriment of the commercial industry.

Portland Cement Association Promotes E. M. Fleming

E. M. FLEMING has been appointed manager of the highways and municipal bureau of the Portland Cement Association with headquarters at the general office in Chicago, effective March 15, according to announcement here by William M. Kinney, general manager of the association. He succeeds L. S. Trainor, who resigned January 1.

Mr. Fleming joined the staff of the association in 1926 as a field engineer in the Indianapolis district, and for the past year has been street engineer in the highways and municipal bureau at Chicago headquarters.

He was associated with the Illinois state division of highways in various executive capacities for approximately six years during construction of that state's model concrete highway system. His experience also includes road contracting, railroad construction with the Pennsylvania railroad, mining engineering and pier and wharf construction.

Mr. Fleming is an alumnus of the University of Pennsylvania and is a member of the American Society of Civil Engineers.

Interstate Crushed Stone Co. Bought by North Jersey Quarry Co.

THE NORTH JERSEY QUARRY CO., Morristown, N. J., I. W. Wortman, president, has taken over the plant of the Interstate Crushed Stone Co., operated by M. M. Bamberger, at Springfield, N. J. This plant is near another of the North Jersey Quarry Co. operations—Commonwealth Quarry Co., at East Summit, N. J. The Interstate plant has a capacity of about 150,000 tons annually, serving the same territory as the Commonwealth plant, and the management of the two plants has been continued.

Mr. Bamberger is associated with the new organization.

E. L. Osborne Made President of Knoxville Sand and Lime Company

E. L. OSBORNE, of Atlanta, Ga., vice-president of the Knoxville Sand and Lime Co. for the past several years, was elected president and general manager of the company at a meeting of the board of directors held March 5.

Mr. Osborn succeeds the late Milton McDermott. The Knoxville Sand and Lime Co. was organized 15 years ago by Mr. McDermott. Mrs. Milton McDermott was elected vice-president and R. O. Bryan, secretary and treasurer by the directors.

The company is the original manufacturer of the famous White marble lime which is being sold throughout the southeast. It also produces sand and is distributor for a general line of building materials.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Feb. 9	Feb. 16	Sand, Stone and Gravel Week ended Feb. 9	Feb. 16
Eastern	2,178	2,279	1,692	1,489
Allegheny	2,790	2,890	1,970	1,996
Pocahontas	132	143	231	329
Southern	369	424	6,291	6,556
Northwestern	568	575	823	969
Central Western	417	439	4,495	5,208
Southwestern	357	317	3,795	3,358
Total	6,811	7,067	19,297	19,905

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

District	Limestone Flux 1928 Period to date Feb. 18	1929 Feb. 16	Sand, Stone and Gravel 1928 Period to date Feb. 18	1929 Feb. 16
Eastern	12,116	14,633	11,695	11,433
Allegheny	18,629	18,659	13,716	12,964
Pocahontas	1,454	822	2,878	2,048
Southern	3,532	2,977	58,520	44,628
Northwestern	3,863	3,468	9,915	4,642
Central Western	2,581	2,963	35,197	33,218
Southwestern	2,776	2,533	28,498	28,757
Total	44,951	46,055	160,419	137,690

COMPARATIVE TOTAL LOADINGS, 1928 AND 1929

	1928	*1929*
Limestone flux	***44,951***	***46,055***
Sand, stone, gravel	***160,419***	***137,690***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning March 9:

SOUTHERN FREIGHT ASSOCIATION DOCKET

44325. **Soapstone or talc** from Sycamore, Ala., to Gadsden, Ala. Present rate, 27c per 100 lb. (6th class). Proposed rate on soapstone or talc, carloads (See Note 3), from Sycamore, Ala., to Gadsden, Ala., 175c per net ton. Made the same as the present rate on this commodity from Alpine to Birmingham, Ala.

44342. **Soapstone, refuse, crushed or ground, from Clifton and Rockfish, Va., to Dunkirk, N. Y., and Framingham, Mass. Sixth class rates now apply. Proposed rates on soapstone, refuse, crushed or ground, carloads (See Note 2), from Clifton and Rockfish, Va.: To Dunkirk, N. Y., 21c, same as the current rate to Niagara Falls, N. Y.; to Framingham, Mass., 26½c per 100 lb., same as the current rate to Boston, Mass.**

44348. **Limestone and marl,** from C. & O. Ry. and N. & W. Ry. Virginia quarries to Virginia and Carolina Southern R. R. stations. It is proposed to reduce rates on limestone and marl, ground or pulverized, carloads, from C. & O. Ry. and N. & W. Ry. Virginia quarries to V. & C. S. R. R. stations between Hope Mills, N. C., and Lumberton, N. C., inclusive, so as not to be higher than the rates currently in effect to Lumberton, N. C., via S. A. L. Ry.

44350. **Slag, crushed stone and granite,** between stations on the Atlantic Coast Line railroad. Carriers propose the publication of the same commodity mileage scales of rates on slag in A. C. L. R. R. Second Division Interstate Tariff I. C. C. B2475, as now applicable on crushed stone and granite. It is also proposed to amend the explanations of Notes C and D of Supplement 18 to that tariff to more clearly indicate the application of the rates subject to these notes.

44353. **Phosphate rock** from Newberry, Fla., to Port Tampa, Fla.—Cancellation. It is proposed to cancel, on the obsolete theory, the present rate of 237c per ton of 2240 lb. on phosphate rock, as per Description A, Item 3354, Agent Speidens' General Export Tariff, from Newberry, Fla., to Port Tampa, Fla. Class M rate of 338c per net ton, as published in A. C. L. R. R. I. C. C. A2466, to apply after cancellation.

Note 1—Minimum weight marked capacity of car.
Note 2—Minimum weight 90% of marked capacity of car.
Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

44411. **Soapstone refuse,** etc., from Clifton and Rockfish, Va., to South Bound Brook, N. J., and Millis, Mass. It is proposed to establish the following reduced rates on soapstone, refuse, crushed or ground, carloads (see Note 2), from Clifton and Rockfish, Va.: To South Bound Brook, N. J., 19½c; to Millis, Mass., 26½c per 100 lb., made with relation to rates in effect to surrounding points.

44431. **Stone, crushed, rubble or broken,** from Pounding Mill, Va., to Virginia destinations. It is proposed to establish rates on stone, crushed, rubble or broken, from Pounding Mill, Va., to Virginia destinations. It is proposed to establish rates on stone, crushed, rubble or broken, carloads (See Note 3), from Pounding Mill, Va., to Virginia destinations located on the Southern Ry., Louisville & Nashville R. R., Interstate R. R., and Clinchfield, R. R., on basis of Docket No. 17517 joint line scale. Statement of proposed rates to the destinations here involved will be furnished upon request.

SOUTHWESTERN FREIGHT BUREAU DOCKET

16904. **Gravel,** from Eau Claire, Wis., to Oklahoma City, Okla. To establish a rate of 30c per 100 lb. on **gravel,** straight carloads or in mixed carloads with **sand** (See Note 2), from Eau Claire, Wis., to Oklahoma City, Okla. The present rate on sand, straight carloads, from Eau Claire, Wis., to Oklahoma City is 30c, as published in Item 7110, S. W. L. Tariff 15-N. Shippers request that the same rate be published on sand and gravel, straight or mixed cars. In support of their request they point out that where commodity rates are in effect on sand and gravel that they are on the same level, e.g., Item 8002, S. W. L. Tariff 1-Q; Item 1045-A, Supplement 45, S. W. L. Tariff 114-C.

16935. **Silica Sand,** from Kansas points to Memphis, Tenn. To establish a rate of 29c per 100 lb. on silica sand, carloads (See Note 1), but not less than 60,000 lb., except where car of less than 60,000 lb. capacity is furnished, at carriers' convenience, the marked capacity of the car will apply, from Arkalon, Kismet, Missler, Meade and Fowler, Kan., to Memphis, Tenn.

Rates are already provided from competing Kansas points in Item 2240, W. T. L. Tariff 33K, and shippers at Arkalon, Kismet, Missler, Meade and Fowler are entitled to same rate as already in effect from Moscow, Satanta, Kan., etc.

16938. **Sand,** from points in Kansas to points in Missouri. To establish the following rates in cents per 100 lb. on sand, carloads (See Note 2), except when weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of the car the actual weight will apply, but in no case minimum weight to be less than 60,000 lb., from Lawrence and Shockey, Kan., to points in Missouri shown below:

To—	Rates
Phenix, Mo.	7½
Clemens No. 21, Mo.	7½
Last Chance, Mo.	7½
Reber, Mo.	8
Buchert, Mo.	8
Liberal, Mo.	8
Liberal Brick Plant, Mo.	8
Vincent, Mo.	8
Wimmer, Mo.	8
Iantha, Mo.	8
Lamar, Mo.	8
Kenoma, Mo.	8
Golden City, Mo.	8
Lockwood, Mo.	8
South Greenfield, Mo.	8
Pilgrim, Mo.	8
Everton, Mo.	8
Emmet, Mo.	8
Ash Grove, Mo.	8
Bois d'Arc, Mo.	8
Elwood, Mo.	8
Nichols, Mo.	8
Karlin, Mo.	8
Morrisville, Mo.	8
Graydon Springs, Mo.	8
Walnut Grove, Mo.	8
Harold, Mo.	8
Pearl, Mo.	8
Willard, Mo.	8
Ritter, Mo.	8
De Mund, Mo.	8
Springfield, Mo.	8

The proposed rates, it is stated, are based 1c per 100 lb. over the present rates from Kansas City, Mo.

16838. **Sand and gravel,** from Memphis, Tenn., to points in Arkansas. To establish a rate of 4c per 100 lb. on sand and gravel, carloads, description and minimum weights as per Item 2096-A of S. W. L. Tariff No. 114-C, from Memphis, Tenn., to Belknap, Dunn, Earle, Glassy Lake, Hanover, Lansing, Le Vesque, McDonald, Parkin, Princedale, River Front, St. Francis and Smithdale, Ark. Interested shippers request the publication of the same rate from Memphis, Tenn., to points in Arkansas mentioned above, as applies in the reverse direction.

16951. **Crushed stone,** from Pilot Knob, Mo., to New Orleans, La. To establish a rate of $3.10 per net ton of 2000 lb. on stone, crushed (broken stone), ranging in size up to 200 lb. weight, minimum weight 80,000 lb., or if marked capacity of car is less than 80,000 lb., marked capacity of car will govern, from Pilot Knob, Mo., to New Orleans, La. Shipper states they are unable to move the traffic on the present rate of $3.45 per ton.

16953. **Sand,** from Richards Spur, Okla., to Herg, Tex. To establish a rate of 7c per 100 lb. on **sand (common), gravel and stone (crushed),** in straight or mixed carloads (See Note 1), except when cars are loaded to visible capacity actual weight shall govern, but in no case less than 50,000 lb., from Richards Spur, Okla., to Herg, Tex. This distance applied to the joint-line "Shreveport Scale" results in the proposed rate of 7c. In view of the application of the "Shreveport Scale" from and to various points in Oklahoma and Texas, it is felt there should be no objection to the extension of this scale to Herg, Tex.

16972. **Chatt sand,** from points in Missouri to interstate points. To establish the following rates in cents per ton of 2000 lb. on chatt sand, carloads, minimum weight 100,000 lb., from Alba, Atlas, Aurora, Carthage, Granby, Joplin, Neck City, Oronogo, Porto Rico, Presperity, Purcell and Webb City-Carterville, Mo., to points shown below:

To	Rate	To	Rate
Evansville, Ind.	315	Glenmont, O.	454
Geneva, Ind.	378	McDermott, O.	454
Kentland, Ind.	378	Sandusky, O.	454
Kokomo, Ind.	366	Amherst, O.	454
Osgood, Ind.	391	Toledo, O.	429
Irvington, Ky.	391	Sharon, Penn.	479
Louisville, Ky.	391	Pittsburgh, Penn.	542
Cincinnati, O.	391	Alexandria, Va.	639
Detroit, Mich.	429	Farmer, Ky.	429
Cleveland, O.	454	Olive Hill, Ky.	429
Columbus, O.	454	Bowling Gr'n, Ky.	391

The present rates, shippers state, are too high to permit movement.

16978. **Sand, gravel,** etc., from Richards Spur, Okla., to points in Texas. To establish a rate of

7c per 100 lb. on **sand (common), gravel and stone (crushed)** in straight or mixed carloads (See Note 1), except when car is loaded to full visible capacity actual weight shall govern, but in no case less than 50,000 lb., from Richards Spur, Okla., to Kirkland, Childress, Carey and Estelline, Tex. The proposed rate, it is stated, is based on the short-line distance from Richards Spur, Okla., applied to the joint-line Shreveport scale as currently published for application between all points in Texas, as per Texas Lines' Tariff No. 2J.

WESTERN TRUNK LINE DOCKET

1825C. **Sand and gravel,** carloads (See Note 2), except that when weight of shipment when loaded to full visible capacity of car is less than 90% of marked capacity of car the actual weight of the car will apply, but in no case shall the minimum carload weight be less than 40,000 lb., from Eau Claire, Wis., to St. Paul, Minneapolis and Minnesota Transfer, Minn. Present rate, 5½c per 100 lb.; proposed, 5c per 100 lb.

6800. **Sand, blast, engine, foundry, glass and molding,** carloads (See Note 1), from Bowes, Ill., to Sheboygan, Wis. Present, class rates; proposed, 210c per ton of 2000 lb.

6784, Supplement 1. Transit, storage at Sioux City, Ia.: **Sand and gravel,** also **crushed stone,** carloads, from Hawarden, Ia. (sand and gravel), Dell Rapids, S. D. (crushed stone), to points beyond Sioux City, Ia. Present, no rates in effect; proposed to allow storage in transit at Sioux City, Ia., on basis of through rate plus transit charge of $2 per **car.**

ILLINOIS FREIGHT ASSOCIATION DOCKET

2392, Sub. 1. **Crushed stone,** carloads, from Thornton, Ill., to T. P. & W. R. R. stations. To Hollis, present, $1.80; proposed, $1.39. To Hamilton, Ill., inclusive, present, $1.80; proposed, $1.39.

4926. **Stone, crushed, rip rap, rubble, ground limestone, chatts, etc.,** carloads, from Lannon, Wis., to St. Louis group as named in C. M. & St. P. and P. G. F. D. 4300H, I. C. C. B5667. Present, combination; proposed, 12.5.

4929. **Crushed stone,** carloads, from Thornton, Ill., to Scottsburg, Good Hope, Sciota, La Harpe, Ferries, McCall, etc., Ill. Present, combination; proposed, $1.39 per net ton.

4896, Sub. 1. **Sand and gravel** (See Note 2), from Joliet and Millsdale, Ill., to Streator, Ill. Rates per ton. Present, 76c; proposed, 65c.

4939. **Sand and gravel,** carloads (See Note 1).

From Pit No. 5, Ill.

To	Pres.	Prop.
Beardstown, Ill.	$0.88	$1.13
Chapin, Ill.	1.01	1.13
Riggston, Ill.	1.01	1.13
Franklin, Ill.	1.01	1.26
Virden, Ill.	1.01	1.26

From Pekin, Ill.

To	Pres.	Prop.
Beardstown, Ill.	$0.88	$1.13
Chapin, Ill.	1.01	1.13
Riggston, Ill.	1.01	1.13
Franklin, Ill.	......	1.26
Virden, Ill.	1.01	1.26

2392. **Crushed stone,** carloads, to Chatsworth, Ill. From Lehigh, Ill., present, 88c; proposed, 76c. From Thornton, Ill., present, 101c; proposed, 89c. Rates per ton of 2000 lb.

4947. **Stone, crushed or pulverized** (in bulk), crushed or rough quarried, in straight or mixed carloads, from Valmeyer, Ill., to points in Illinois, Missouri and Wisconsin. Present, 8c per ton over Krause rates. Proposed, 3c per ton over Krause rates.

4950. **Sand and gravel,** except glass, silica or molding sand, carloads, from Muscatine, Ia., to T. P. & W. R. R. stations.

To	Pres.	Prop.
Chenoa, Ill.	**	$1.36
Meadows, Ill.	**	1.36
Gridley, Ill.	**	1.36
Enright, Ill.	**	1.36

**Class rates.

Proposed rates per net ton.

4951. **Stone, broken, crushed or ground,** carloads, from McManus and Keokuk, Ia., to destinations on C. B. & Q. R. R. in Illinois, to (representative points). Rates in cents per net ton.

To	Pres.	Prop.
Quincy	113	90
Coatsburg	126	100
Augusta	139	110
Seehorn	190	95
Pike	210	110
Macomb	164	120

CENTRAL FREIGHT ASSOCIATION DOCKET

20819. To establish on **sand and gravel,** carloads, from Troy, O., to B. & O. R. R. stations shown below, following rates (in cents per net ton):

To	Prop.	Pres.
Stockton, O.	70	80
Glendale, O.	70	80
Woodlawn, O.	70	100
Park Place, O.	70	100
Wyoming, O.	70	100
Lockland, O.	70	100
Maplewood, O.	70	100
Hartwell, O.	70	100
Carthage, O.	70	100
Elmwood Place, O.	70	100
Ivorydale, O.	70	100
Winton Junction, O.	70	100
Winton Place, O.	70	110
College Hill Junction, O.	70	100
Northside, O.	70	100
South Side, O.	70	100
Fairmont, O.	70	110
Brighton, O.	70	110
Gest Street, O.	70	110
Cincinnati, O.	70	110

20835. To establish on **crushed stone,** carloads, East Liberty, O., to Apple Creek and Gambier, O., rates of 125c and 105c per net ton. Present rate, sixth class.

20841. To establish following rates on **roasted dolomite,** carloads, minimum weight 50,000 lb., Narlo, O., to points east of the western termini of Eastern Trunk Lines:

To	Pres.	Prop.
Albany, N. Y.	27	18½
Baltimore, Md.	25½	16½
Boston, Mass.	30½	21½
Cumberland, Md.	22	15
New York, N. Y.	28½	19½
Newport News, Va.	25½	16½
Norfolk, Va.	25½	16½
Philadelphia, Penn.	26½	17½
Rochester, N. Y.	21½	16½
Rockland, Me.	30½	21½
Syracuse, N. Y.	27	16½
Utica, N. Y.	25	17

20860. To establish on **crushed stone,** carloads, White Sulphur, O., to Ontario and Mansfield, O., rate of 85c per net ton. Present rate, 90c per net ton.

20862. To establish on **crushed stone** and **crushed stone screenings,** carloads, Delphos, O., to Alvordton, O., via N. Y. C. & St. L. R. R., Ohio City, O., C. N. R. R. rate of 100c per net ton. Present rate, sixth **class.**

20866. To establish on **refuse foundry sand,** carloads, minimum weight 50,000 lb., Middletown, O., to Lockland O., rate of 100c per net ton. Present rate, sixth class rate of 11½c.

20931. To establish a rate of 90c per net ton on **sand** (all kinds) **and gravel,** from Massillon, Crystal Springs, Warwick and Barberton, O., to Girard and Niles, O. Present rate, 80c per net ton.

20899. To establish on **sand and gravel,** carloads, Gravel Pit, O., to Kennedy Heights, O., via N. & W. Ry., Idlewild, O., and P. R. R. (W. L.), rate of 70c per ton of 2000 lb. Present rate, 80c per ton of 2000 lb.

20901. To establish on **crushed stone,** carloads, Melvin and Thrifton, O., to stations on B. & O. R. R. in West Virginia, rates as shown in Exhibit "A" attached. Present and proposed rates, as shown in Exhibit "A."

EXHIBIT "A"

From Melvin, O., to	Prop.	Pres.
Wheeling, W. Va.	$1.60	22
Thompson, W. Va.	1.60	22
Mendota, W. Va.	1.50	21
St. Marys, W. Va.	1.40	20½
Polk, W. Va.	1.40	20
Sherman, W. Va.	1.40	20
Longdale, W. Va.	1.50	19½
Pt. Pleasant, W. Va.	1.60	17
Henderson, W. Va.	1.60	18½
Crown City, W. Va.	1.70	18½
Green Bottom, W. Va.	1.70	18½
Kenova, W. Va.	*1.80	18½
Liverpool, W. Va.	1.50	31
Spencer, W. Va.	1.60	31
Evans, W. Va.	1.50	28½
Ripley, W. Va.	1.60	28½
Cameron, W. Va.	1.60	24
Denver, W. Va.	1.60	24
Wilfong, W. Va.	1.70	24
Mannington, W. Va.	1.70	24
Farmington, W. Va.	*1.80	24
Gaston Junction, W. Va.	*1.80	24
Hammond, W. Va.	*1.80	24
Worthington, W. Va.	1.70	24
Pennois, W. Va.	1.70	24
Fairmont, W. Va.	*1.80	24
Jacksonburg, W. Va.	1.60	24
Lumberton, W. Va.	1.70	24
From Thrifton, O., to	Prop.	Pres.
Wheeling, W. Va.	$1.60	22
Thompson, W. Va.	1.50	22
Mendota, W. Va.	1.40	19½
St. Marys, W. Va.	1.30	18½
Polk, W. Va.	1.30	18
Sherman, W. Va.	1.40	18
Longdale, W. Va.	1.40	17
Pt. Pleasant, W. Va.	1.50	16
Henderson, W. Va.	1.60	16½
Crown City, W. Va.	1.60	16½
Green Bottom, W. Va.	1.70	16½
Kenova, W. Va.	1.70	16
Liverpool, W. Va.	1.40	29
Spencer, W. Va.	1.50	29
Evans, W. Va.	1.40	26
Ripley, W. Va.	1.50	26
Cameron, W. Va.	1.60	24
Denver, W. Va.	1.70	24
Wilfong, W. Va.	1.70	24
Farmington, W. Va.	1.70	24
Gaston Junction, W. Va.	1.70	24
Hammond, W. Va.	1.70	24
Worthington, W. Va.	1.60	24
Pennois, W. Va.	1.70	24
Fairmont, W. Va.	1.70	24
Jacksonburg, W. Va.	1.50	24
Lumberport, W. Va.	1.60	24
Cairo, W. Va.	1.30	24
West Union, W. Va.	1.40	24
Wilsonburg, W. Va.	1.50	24
Grafton, W. Va.	1.60	24

Present rates in cents per 100 lb., proposed rates in cents per net ton.

TRUNK LINE ASSOCIATION DOCKET

20332. **Crushed stone** (See Note 2), from Hyndman, Penn., to stations on B. & O. R. R. in state of Pennsylvania, rates ranging from 60c to $1.30 per net ton; also from Hyndman to Vanderbilt (P. & L. E.), Penn., $1.30, and Lap, Md., 90c; Sheridan, Frostburg, Colmar, Md., and Deal, Penn. (Western Maryland Ry.), $1 per net ton. Reason—Proposed rates comparable with rates on like commodities for like distances, services and conditions.

20339. **Gravel and sand** (other than blast, engine, glass, molding or foundry, quartz, silex and silica), carloads (See Note 2), from Pasadena, Bragers and Bowie Road, Md., to Western Maryland Ry. points, Hillen, Arlington, Deerfield, Md., Shippensburg, York, Charmian, Penn., Cavetown, Hagerstown, Cumberland, Md., Cherry Run, W. Va., various rates ranging from 70c to $1.70 per net ton. Reason—Proposed rates comparable with rates on like commodity for like distances, service and conditions.

20340. **Crushed stone,** carloads (See Note 2), from B. & O. shipping points in the Frederick, Md.-Strasburg, Va.-Martinsburg, W. V., districts to stations on the West Virginia division of the Western Maryland Ry., rates ranging from $1.30 to $2.10 per net ton. Reason—Proposed rates comparable with those in effect to same destinations from points of origin on the Western Maryland Ry. and with rates from the same shipping points to destinations on the B. & O. R. R. and Monongahela R. R. for relative distances.

20348. **Sand and gravel,** carloads (See Note 2), from Tannery, Penn., to Nesquehoning, Penn., 90c per net ton. Reason—The proposed rate is the same as now in effect to Seek, Coaldale, Lansford and Tamaqua, Penn.

20367. **Stone chips or granules,** carloads, minimum weight 40,000 lb., from Texas and Cookeysville, Md. (rates in cents per net ton).

To	Prop.
York, Penn.	105
Laurel, Md.	125
Washington, D. C.	125
Lancaster, Penn.	140
Harrisburg, Penn.	140
Philadelphia, Penn.	195
Bridgeton, N. J.	225
New York, N. Y.	235
Brooklyn, N. Y.	235

Reason—The proposed rates are fairly comparable with rates on crushed stone and stone chips and granules, from Cockeysville, Md., to Baltimore, **Md.**

20373. **Sand, molding and silica,** carloads (See Note 2), from Mapleton district, Penn., to Toronto, Ont., 18½c per 100 lb. Reason—The proposed rate is fairly comparable with rates now in force from Williamsport Basis to Maple, Ont.

20403. **Crushed stone,** carloads (See Note 2), from Le Roy, N. Y., to Elmira and Elmira Heights, N. Y., $1 per net ton. Reason—The proposed rate is comparable with rates now in force to Dunkirk, Sheridan and Horseheads, N. Y.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

16325. To cancel commodity rates on **crushed stone** (See Note 2), from Branford, Meriden, Conn., etc., to points in Massachusetts named in N. Y. N. H. & H. R. R. I. C. C. F2795. Reason—To cancel specific commodity rates and restore mileage rates, account no necessity for continuing less than mileage basis.

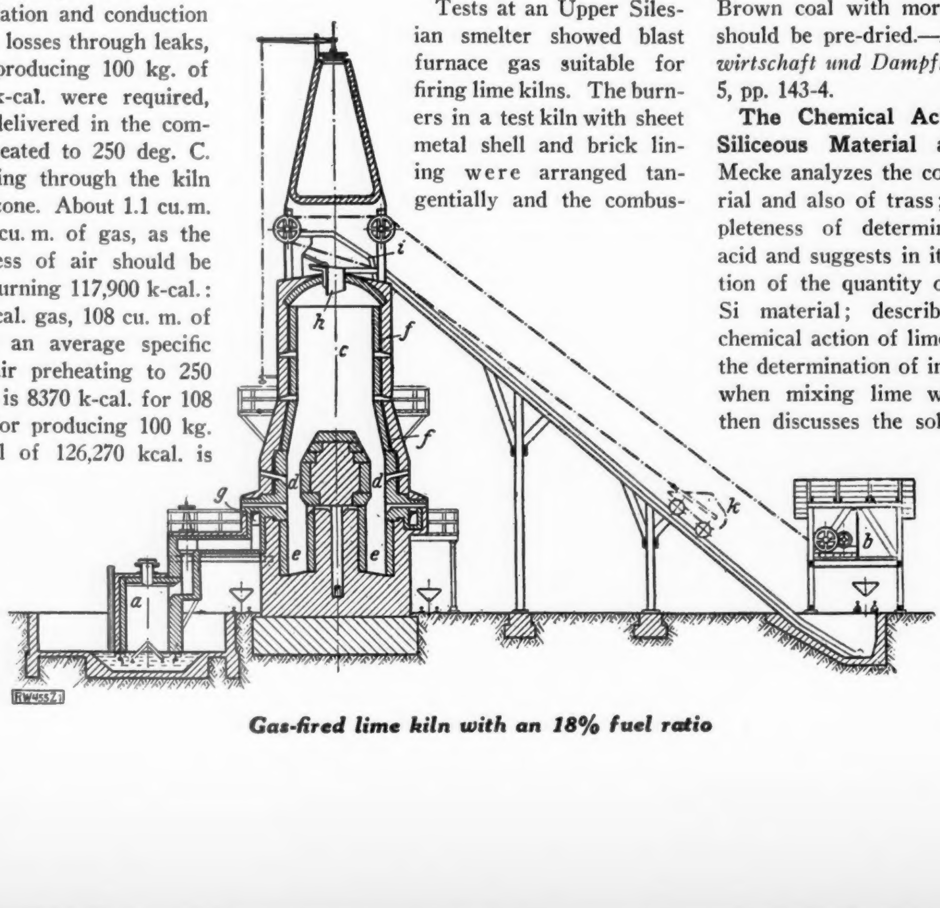
16328. **Crushed stone,** carloads (See Note 2), from Brewsters, N. Y., to Boston, Mass., $1.60 net ton. (To include B. & A. R. R. switching charges at Boston.) Reason—To **equalize rate via N. Y. C.**-B. & A. R. R. route.

16330. To provide for carload minimum weight of 40,000 lb. on **limestone** (except agricultural), from Ashley Falls, Mass., Canaan, Danbury (Conn. Agstone, Inc., siding), East Canaan, Conn., Great Barrington, Lee, Mass., New Milford, Conn., Pittsfield, Mass., Redding, Conn., Sheffield and West Stockbridge, Mass., to all N. Y. N. H. & H. R. R. stations. Reason—To equalize conditions.

Foreign Abstracts and Patent Review

Heat Consumption of Gas-Fired Lime Kilns. H. Haelbig, chief engineer of Mathias Paulus, Kattowitz, presents operating data on burning lime with pit-coal gas, precautions for reducing heat losses, and test results on firing blast-furnace gas and brown-coal gas. The lime-burning plant, Fig. 1, consists of four shaft kilns fired with pit-coal gas, built several years ago. The fuel consumption is 18% of the lime drawn, and in 24 hours the four kilns produce 80 to 100 metric tons of thoroughly well-burned lime. The gas producers operate with 250 mm. (9.8 in.) water gage of blower pressure, and the air volume delivered is 50 cu. m. (1 cu. m. is 35.3 cu. ft.) per minute, and the quantity of steam is 300 grams per cu. m. (0.299 oz. per cu. ft.). The pit coal used for gasefication has a maximum heating value of 6000 k-cal. per kg. (10,800 B.t.u. per lb.). Analysis of the gas showed 3.2% CO_2, 0.2% O_2, 24% CO, 11.2% H_2, 2.4% CH_4. The heating value of the gas is consequently 1200 k-cal. per cu. m. (1 k-cal. is about 4 B.t.u., or a total of 3968 B.t.u.). The raw limestone yielded 56 kg. of burned lime per 100 kg. (1 kg. is 2.2 lb.). The remainder of the stone, 44%, is mostly carbonic acid, and was expelled almost completely in burning. Therefore, for producing 56 kg. of burned lime or burning 100 kg. of raw limestone, 66,000 k-cal. were required, in which all heat losses, considerable in lime burning, are considered, including heat in the waste gases, incombustible in the waste gases, incombustible in the ashes of the gas producers, heat in the drawn lime, radiation and conduction losses of the kiln lining, losses through leaks, etc. Accordingly, for producing 100 kg. of burned lime, 117,900 k-cal. were required, exclusive of the heat delivered in the combustion air, which is heated to 250 deg. C. (482 deg. F.) in passing through the kiln linings and the cooling zone. About 1.1 cu. m. of air is used with 1 cu. m. of gas, as the minimum possible excess of air should be maintained. Thus, in burning 117,900 k-cal.: in 98 cu. m. of 1200 k-cal. gas, 108 cu. m. of air was required. At an average specific heat of 0.31 and an air preheating to 250 deg. C., the heat supply is 8370 k-cal. for 108 cu. m. of air, so that for producing 100 kg. of burned lime a total of 126,270 kcal. is required.

Another lime kiln under fire was supplied with gas from two simple shaft generators supplied with air at 200 to 250 mm. (7.9 to 9.8 in.) water gage pressure. The analysis of the employed pit coal of high ash content showed 61.34% C, 4.08% H, 12.35% O (plus N), 3.55% moisture, 18.48% ashes; giving a heat value of 5800 k-cal. per kg. During the test period, a month in the cold season, 1,304,000 kg. of raw limestone were burned with a coal consumption of 201,700 kg. or 15.47% of the raw limestone or 27.6% of the burned lime. Accordingly 160,000 kcal. were used for producing 100 kg. of burned lime. The heat consumption of this kiln is therefore 27% greater than that of the preceding kiln; in other words, only 44.38% of the generated heat was utilized as compared to 56.5% in the preceding kiln, the heat losses in the second kiln being as follows: Sensible heat in the waste gases, 13.20%; incombustible in the waste gases, 0.72%; incombustible in the ashes, 19.02%; heat in the drawn lime, 2.36%; lining losses and balance, 20.32%; totaling a loss of 55.62%. These figures give a theoretical heat requirement of 713 kcal. for producing 1 kg. of lime. The theoretical figure of Dr. Schack for producing 1 kg. of CaO is 760 kcal., upon which basis the efficiencies of the kilns would be 60% and 47.5% respectively. The incombustible in the ashes of shaft generators should not exceed 4%, and in rotary grate generators, 2%. An effective insulation against heat radiation and conduction is the Sterchamol insulation, which is a highly porous product consisting of 76.24% silicic acid and 11.2% alumina, which is recommended for the lime kiln, gas lines and gas producers.



Gas-fired lime kiln with an 18% fuel ratio

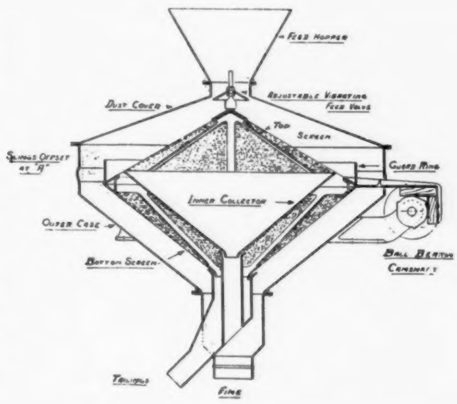
Tests at an Upper Silesian smelter showed blast furnace gas suitable for firing lime kilns. The burners in a test kiln with sheet metal shell and brick lining were arranged tangentially and the combustion air supplied from the blast furnace blower air and mixed with the gas at the burner outlet. The combustion temperature was about 900 deg. C. (1652 deg. F.); the lime was well burned and satisfactory in slaking. In producing at the rate of 10 kg. of burned lime per hour, the test kiln required 2.5 cu. m. of blast furnace gas per 1 kg. of burned lime. However, in a customary kiln of 20 to 25 ton production capacity per day, the gas requirement would decrease to 1.5 to 2 cu. m. per 1 kg. of burned lime, due to lower heat losses and use of air preheated in the cooling zone. In burning dolomite, as much as 3.5 cu. m. of blast furnace gas per 1 kg. of burned dolomite was required, when the gas and air were preheated to 300 deg. C. (572 deg. F.), to attain the higher burning temperatures required with dolomite.

In operating a lime kiln of 75 cu. m. volume for 75 hours, when firing raw brown coal of 2200 kcal. per kg. calorific value and of 38% moisture content, 22.5 tons of burned lime were produced in 24 hours with a fuel consumption of 60% based upon the lime drawn. This brown coal was gasefied in a rotary grate generator of 2.1 m. inside width at the rate of 15 to 17 tons per 24 hours. The gas temperature was 300 deg. C. at the generator outlet, which indicates much water in the gas, and 1 kg. of brown coal delivered 1.7 cu. m. of gas of 1150 B.t.u. per cu. m., according to which 102 cu. m. of gas or 117,300 B.t.u. were used to burn 100 kg. of lime, and the efficiency of the kiln was 60%. Brown coal with more than 40% of water should be pre-dried.—*Archiv fuer Waermewirtschaft und Dampfkesselwesen* (1928), **9**, 5, pp. 143-4.

The Chemical Action of Lime Upon Siliceous Material and Trass. Dr. P. Mecke analyzes the composition of Si material and also of trass; discusses the imcompleteness of determining the soda-soluble acid and suggests in its place the determination of the quantity of baryte fixed by the Si material; describes the physical and chemical action of lime upon Si material and the determination of increases in temperature when mixing lime with Si material; and then discusses the solubility of Si material and trass in hydrochloric acid solutions; and the influence of carbonic acid as well as solubility in soda solution and caustic potash solution. Due to its low solubility, lime is unsuitable for a rapid analysis, but after an

extended action it gives results which tally exactly with those of the baryte method. In this baryte method for determining the lime fixed by the Si material, 1.0 gram of Si material is placed in a tall flask, into which exactly 50 cu. cm. of baryte solution is poured. The flask is then closed with a rubber stop around which parchment paper or linen is wrapped, placed in cold water, which is then gradually raised to a boiling point, and boiled for one-half hour, after which the flask, having been repeatedly and thoroughly shaken while in the water, is cooled and set aside for several hours until the solution above the precipitate has completely cleared. Of this solution 2.5 cu. cm. is pipetted off without previous filtering, which is, after the addition of phenol phthalein, titrated with ½ normal hydrocloric acid solution until the color is a slight rose or disappears. This must be done as quickly as possible to avoid absorption of carbonic acid; and it is recommended to make two tests and determine in the first approximately the amount of hydrochloric acid used. The baryte solution is of about 2.5% and is prepared by dissolving about 48 to 50 gram of crystalline barium hydrate per liter, which is filtered after having been set aside for one day; 50 cu. cm. of this solution corresponds to about 30 cu. cm. of ½ normal hydrochloric acid. As an example, in one test the titer of the barium solution was 50 cu. cm. equals 29.0 cu. cm. of ½ normal hydrochloric acid. The pipetted 25 cu. cm. of baryte solution required 10 cu. cm. of ½ normal hydrochloric acid until discoloring; consequently the 0.5 gram of Si material fixed 14.6 minus 10 equals 4.6 cu. cm. of ½ normal barium solution, or 1 gram, 9.2 cu. cm.; that is, 1.0 gram of Si material fixed 9.2 times 0.0427 barium equals 0.392 gram barium hydrate, corresponding to 0.170 $Ca(OH)_2$. The values obtained by this method may be expressed as "baryte figures" equaling cu. cm. of ½ normal baryte solution, or as "lime figures," equaling milligram calcium hydrate, which is fixed by 1.0 gram of Si material; so that the figures in this example are baryte figure 9.2 and lime figure 170. If the substance, as Si material, contains sulphuric acid, 0.5 is to be deducted from the baryte figure obtained for each 1% of SO_3 to determine the quantity of baryte not fixed to the sulphuric acid. In 10 determinations the baryte figure fluctuated only between 9.1 and 9.3. The analysis of the air-dry Si material employed was: moisture, 7.01%; ignition, loss (including SO_3, etc.), 11.12%; SiO_2, 59,79%; Al_2O_3, 16.60%; Fe_2O_3, 2.81%; SO_3, 6.37%; CaO, 0.80%; totaling 104.50%, of which is soluble in water: Al_2O_3, 0.28%; CaO, 0.10% SO_3, 1.40%; alkalies and magnesia, 0.21%. A precipitated silicic acid hydrate had a baryte figure of 30.8; trass a figure of 1.9.—*Tonindustrie-Zeitung* (1928), 52, 74, pp. 1498-1499; 75, pp. 1517-1519.

New English Vibrating Screen. An English screen that is said to be exceptionally efficient in separations on the finer sizes is described in the *British Limemaster* for October, 1928. It is called the "Vicona" separator, and it is shown in section in the accompanying illustration. The screening portion consists of two or more conical



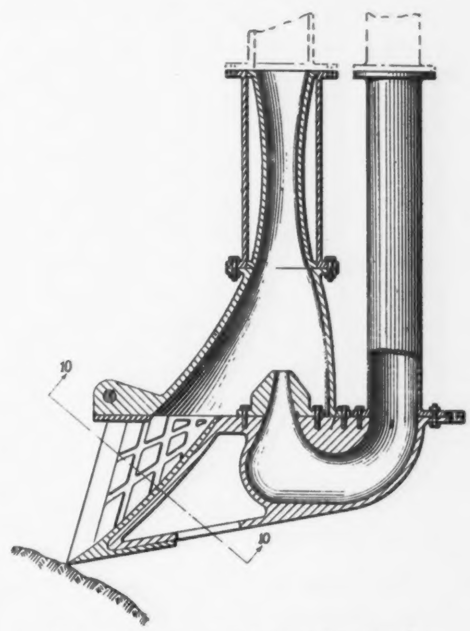
English conical vibrating screen

screens on a frame that is vibrated by a cam. In the form illustrated only two screens are used, but in another form there are three screens to produce one more size. The frame is hung on two points and rests on a cam for the third of a three point suspension. The cam is made so that it gives both a vertical and a horizontal motion and this combination is said to be very effective in cleaning the screen and keeping it from blinding. Referring to the cut, the feed goes into the feed hopper shown and passes to the screens through an adjustable vibrating valve. The upper screen is an upright cone and most of the fines pass through it and fall into the hopper marked "interior collector." The rejects then flow over a screen which is an inverted cone, which takes out any fines that may have passed over the first screen. The coarse oversize goes out through the spout marked "talings" and the fines from the inner and outer collectors go through the spout marked "fine." Both screens are vibrated by the same mechanism, the eight-sided cam shown at one side of the cut. The sides of the cam give horizontal and the teeth vertical movement.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

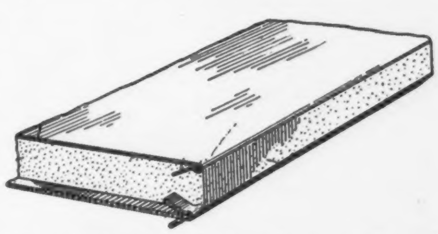
Jet Elevator Dredge With Plow Point. A dredge which is in some respects a combination of suction dredge and dipper dredge has been patented by John M. Nicol, of Grass Valley, Calif. It uses a jet elevator to provide the suction and a plow shaped point to dig into the bed of the river or pond from which the material is to be raised. The plow point and suction head are on the end of a boom that can be worked like the dipper stick of a dipper dredge. The inventor says that it can be moved back and forth with short strokes to dig the bottom enough to let the suction raise the material it loosens or it may be raised to the top to dispose of stones too large to enter the suction. The suction pipe and the pipe to supply the jet with water (which is connected to a centrifugal pump) are telescoping to allow for digging at various depths and for the movement of the boom. The illustration shows the combination of jet head



Plow point on a jet elevator dredge

for the suction and plow point for digging.—U. S. Patent No. 1,690,239.

Reinforced-Edge Plaster Board. The invention relates to a method of protecting the corners and edges of gypsum wallboard or of any cementitious cored board by folding the top and bottom papers so as to



Plaster board with the edges reinforced

form beads which envelop lengths of string or cord along the entire length of the board. *J. Schumacher,* U. S. Patent No. 1,690,253.

Canada Cement Reduces Western Prices

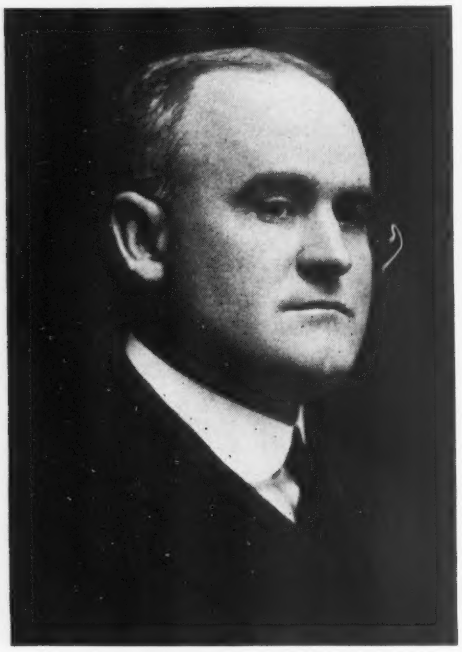
IT WAS ANNOUNCED March 7 from the office of the Canada Cement Co., Ltd., Montreal, Que., that the price of cement had been reduced 10 to 15 cents a barrel in Manitoba, Saskatchewan and Alberta. This means a saving to consumers in the West of $150,000 a year and it is the second reduction within a year. Cement is all produced in the West and this reduction on the company's part is in line with its policy of reducing prices to increase consumption.

Eye Safety Is Theme at La Salle, Illinois, Meeting of P. C. A. Mills

THE FOURTH REGIONAL SAFETY MEETING of the 1929 series by the Portland Cement Association was held in La Salle, Ill., on February 26. The mills represented were as follows: Alpha Portland Cement Co., La Salle and St. Louis; the Atlas Portland Cement Co., Hannibal, Mo.; Lehigh Portland Cement Co., Oglesby, Ill.; Marquette Cement Manufacturing Co., La Salle, Ill., and Cape Girardeau, Mo.; Missouri Portland Cement Co., St. Louis; and Universal Portland Cement Co., Buffington, Ind.

John Young, superintendent of the Lehigh mill at Oglesby acted as chairman of the committee of arrangements and was assisted by Henry McClarnan, general superintendent of the Alpha, Richard Moyle, Sr., general superintendent of the Marquette, W. E. Gorg, assistant treasurer of the Missouri, and W. E. Wuerth, works manager of the Sandusky.

A special committee appointed to receive the out-of-town delegates and over thirty



Henry McClarnan

guests of honor consisted of J. J. Kelly, director of Industrial Relations (Marquette), S. A. Kidd (Lehigh), C. M. Butler (Marquette) and Joseph Lawniczak (Alpha).

Care of the Eyes Central Theme

Protection of the eyes was the central theme of the meeting, the two principal speakers on that subject being Dr. R. H. Woods, an eye, ear, nose and throat specialist at La Salle, and Walter Darling of Cincinnati, who lost his eyesight in an industrial explosion a few years ago. Both of the speakers talked interestingly and conveyed a great deal of valuable information. Mr. Darling, who devotes his entire time to saving the sight of others, told of his own experiences and warned those present against the terrific cost of blindness.

Dr. Woods illustrated his talk with charts describing the eye and its functions, as well as methods and effects of injury, very minutely. His remarks were in part as follows:

"I know of a steel plant in Omaha that has eliminated eye injuries practically 100%. If this can be done in a steel plant it can be done in all machine shops from which most of the eye injuries come. Eye injuries occur *too* frequently—not so frequently as five years ago, but there are more than there should be. Non-shatterable goggles with enforced use are the solution. Any employe caught at an emery wheel or other hazard without eye protection should be laid off no matter how busy the season. Disciplining three or four men will be all that will be needed to enforce the order.

"Eye injuries are of two general types, perforating and non-perforating. A perforating injury makes a double hazard. The uninjured eye may become involved and lost, giving rise to total disability. The non-perforating is the more frequent and one which I desire to particularly direct your attention.

"Non-perforating injuries may be subdivided into superficial or deep. I am confining myself to corneal injuries, such as burns, foreign bodies, abrasion and cuts. Superficial injuries give rise to no loss of vision. Deep injuries invariably leave a scar. Neglected superficial injuries may become deep and leave scars and loss of vision.

"If you will recall the sketch I made of the two eyes and the six muscles to each eye one can readily comprehend that to put the injured eye at rest for repairs it is also necessary to keep its mate at rest. With any corneal injury as with an injured extremity, rest to the part is the first law to obtain repair.

"Eye injuries should not occur. When they happen it is invariably due to carelessness either on the part of the plant management in not providing proper protection or on the part of the employe himself. It is useless to try to sidestep the issue after such an accident occurs.

"My personal opinion is that when an eye injury occurs it should be so marked on the monthly report, rating the accident according to the vision lost. In eye injuries the time lost element should not be considered in any contest. Every eye injury should grade against the department and against the plant and if there is a loss of any percentage of vision that should grade further against the plant. In short there should be *no* eye injuries.

"Foreign bodies on the cornea are by far

W. E. Gorg

the most frequent of all non-perforating injuries and because of their frequency are the greatest causative factor in loss of vision. The removal of a foreign body from the cornea is the most delicate operation performed by an oculist. Yet the foreman of the plant may consider it trivial and proceeds to dig it out with a dirty pocket knife or soiled handkerchief, as a consequence of which the oculist doesn't see the eye until it is ulcerated and visual loss certain.

"The eye of a healthy individual heals over in a few hours. The technique then is to remove all the foreign body with the least possible trauma. None of the epithelium surround the embedded particle should be disturbed and the eschar or burned-in base should be deftly curretted out. The sharpest points obtainable are most desirable and all under surgical asepsis. When you consider that the cornea is less than a millimeter in thickness you fully comprehend what is meant by delicate and deft skill. Fortunately nearly all foreign bodies are sterile by vir-

tue of being hot or becoming hot by rapid transit through the air. Ulcers and the inevitable loss of vision result through unskilful manipulation, delayed, neglected or inadequate treatment and lowered resistance of the patient. Individuals of robust constitution as for instance, railroaders, offer little difficulty but with the improperly fed and poorly housed, the trivial foreign body occasionally costs $1500. I want to particularly impress on your minds the importance of putting through an order in your respective plants demanding early and efficient care of all eye injuries regardless of how apparently inconsequential.

"Cement burns on the cornea in the last two years have been negligible. It is evident in my mind that some of the former evils of our local plants have been corrected. These burns are painful and treacherous. Because of the pain the case is sent immediately to the oculist. As new cement is surgically clean, the danger lies in the possibility of subsequent infection. These cement burns as a safety-first measure should be hospitalized with both eyes at rest for 24 to 48 hours until all danger of infection and ulceration is past.

"One more factor regarding the older men. As pointed out in one of the drawings it was shown that the eyes lose their focusing power as age progresses. It is a physiological change that occurs to all of us. The individual may have had normal vision when accepted, but because of this physiological change and a high area of refracture, vision may be reduced in time to lower than industrial blindness with absolutely nothing wrong except the need of glasses. These men are bad risks to themselves and to fellow workmen unless glasses are worn. I have known big claims to have been paid on this score. If periodic examinations had been made by a reputable physician and records kept, all controversy would have been eliminated.

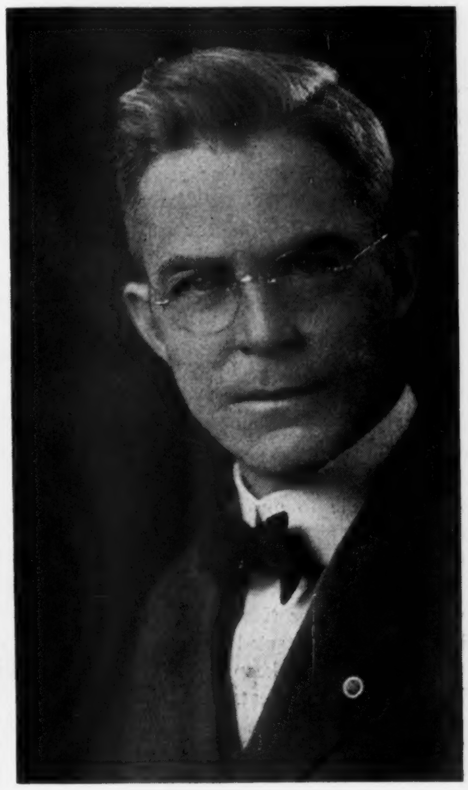
"Physicians should make these periodic surveys because before Industrial Boards the testimony of an optician has little or no weight and again a survey made by any but a medical man fails to uncover pathological defects that might prove very expensive in case of litigation."

General Health and Hygiene

On the subject of general hygiene, physical examination and related subjects, Dr. Woods spoke as follows:

"Every plant management spends thousands annually on new and more efficient machinery. They spend thousands on replacements, repairs and repeated inspection, knowing from past experience that a breakdown means lost time and delays adding to the production cost.

"By the same token nearly every big plant employs a surgeon whose duty, among other things, is to examine and approve or reject every new applicant for employment. Vision must come to a given standard, hearing, throat, heart, lungs, abdomen and extremities must be acceptable. The new employe must be well nourished and physically sound. There are two factors in this examination that I believe are being passed over too superficially, both of which are very important to the health of the individuals and hence their efficiency. These are the accessory nasal sinuses and teeth, of which I will speak again further on. To maintain the highest efficiency and lowest cost in man power, I believe that the policy carried out by the railroads should be adopted in every



Dr. R. H. Woods

plant and that is periodic examinations of each employe from the office force down.

"There is another factor directly responsible for lowered production and one which few plants take cognizance of and which on a moment's reflection will reveal itself very important. The expense of correcting, I believe, would be fully compensated by increased efficiency. I have reference to the workman's housing, water supply, sanitation and food. A workman's home should be clean, and well ventilated; there should be no crowding and the food should be better chosen and prepared. In the food consideration the office force from the president down to the office cub get articles of diet not suited to their best efficiency and the workman through ignorance on the part of the housewife does not get caloric values and food with a balanced vitamin content he should have to insure high efficiency for duty and a rapid healing in case of injury.

"This is a safety-first era, but despite the cautions, safety devices, shop organization and whatnot, accidents do occur; the problem now is to cut them still lower and eliminate carelessness on the part of every employe and have each individual in top notch physical condition so that if accidents do occur there will be a minimum loss of time.

"A part of the problem is to eliminate sickness from the community. This begins in the back yard. Open garbage cans and uncleanly outhouses with a subsequent increased fly nuisance and the accompanying fly-born diseases should be corrected. Good water, clean and ample milk supply and the teaching of the housewives modern ideas of ordinary sterilization should be incorporated.

"In the winter time crowding is a factor in the workman's home. The average foreign born workman has no conception of ventilated sleeping rooms and as many as five or six sleeping in a small room with tight windows. An individual sleeping in a room of this description cannot go on the job the next morning with a clear head, neither can his family be in ordinary good health.

"These ideas of having the employe constantly in prime health, well nourished with adequate balanced rations has been forcibly impressed on me in the last eight months. A certain industry were forced to take on men without physical examination, men out of work for a period of time, living on rations not suited to maintain resistance and quick healing so that trivial injuries have proven to be very expensive affairs. If I may use a concrete example and you will allow a personal application, I will state my own case. On my return from the service I was compelled to put in sixteen to eighteen hours a day. Little attention was given to a balanced diet, and hours of rest were irregular. A corner of a newspaper merely touched the cornea of one eye. Very trivial. It should have healed in two or three hours. Lowered vitality from improper diet, broken rest and general fatigue put this eye in the hospital for ten days with a month's loss of time.

"In our own community the problem of sanitation is well looked after through the Hygienic Institute. With communities not so fortunate each plant should train a woman whose business it would be to make a frequent survey of the sanitation, housing and character of the food of the employes and by good diplomacy gradually educate the housewives along the lines of preparing better food for the family at a lower cost to the family budget, and diplomatically instructing on ordinary precautions of sanitation and housing. The expense would be little as compared to the results obtained in the elimination of hours lost in delayed healing and efficiency gained in daily routine."

Other Subjects Discussed

The program continued with discussion of other subjects as follows:

Improving our Safety Records—A. J. R. Curtis, assistant to general manager, Portland Cement Association, Chicago.

How The Cape Girardeau Plant Won Its

Trophy—M. P. Greer, safety director, Marquette Cement Manufacturing Co., Cape Girardeau, Mo.

Organization of the Plant Safety Committee, led by H. H. Brewer, plant engineer, Alpha Portland Cement Co., La Salle, Ill.

Instruction and Protection of New Employes, led by F. H. Sass, manager, Department of Safety and Relief, Universal Portland Cement Co., Buffington, Ind.

Quarry Hazards and Precautions, led by R. D. McElhaney, quarry foreman, Lehigh Portland Cement Co., Oglesby, Ill.

Manning P. Greer

Preventing Electrical Accidents, led by J. W. Temm, chief electrician, Alpha Portland Cement Co., La Salle, Ill.

Erection of Heavy Machinery Without Accidents, led by Frank Baumgardner, power engineer, Marquette Cement Manufacturing Co., La Salle, Ill.

Accident Statistics and How to Utilize Them, led by W. E. Gorg, assistant treasurer, Missouri Portland Cement Co., St. Louis, Mo.

First Aid Training as an Accident Preventative, led by A. U. Miller, engineer, U. S. Bureau of Mines, Vincennes, Ind.

Accident Statistics and How to Best Utilize Them

In presenting the subject assigned him, W. E. Gorg (assistant treasurer, Missouri Portland Cement Co.) spoke as follows:

"The two major problems in connection with industrial accident statistics are how to collect and tabulate them and how to analyze and utilize them.

"Obviously the possibility of employing these statistics in any way that might be valuable depends first of all on finding the real cause of the accident and reporting it accurately and in sufficient detail. If you will do this, the accident report will become valuable in preventing recurrence and of far more importance than a mere page of figures. If you do not, the possibilities for deriving benefit from these reports will be greatly diminished. This idea does not only apply to lost-time accidents but to the most trivial mishap as well. A painstaking investigation and the carefully prepared and complete report of an accident are of the greatest value. I do not believe that there is an extra line on the accident report forms we are using nor an unnecessary question asked. Therefore, I would suggest to all plants that they make a practice of giving the Portland Cement Association all the information asked for and of doing so in a most careful and complete manner.

"Let me tell you of a factory down in our state. At this plant there were a hundred or more minor accidents a month as a result of employees stumbling on the stairs. One day an employe was seriously injured in this way. Then the factory superintendent set out to find the cause. He discovered that the men and women used the same stairway and that some of the boys paid more attention to the women than they did to where they were walking. The superintendent partitioned the stairway so that one side was used by the men and the other by the women. Accidents from this cause dwindled at once.

"The usual reason for keeping statistics is to be able to measure progress or lack of progress as the case may be. It is by acquiring a fund of data on the subject that further progress is facilitated. Babe Ruth would not be the 'Home-Run King' if nobody had ever started recording his home runs. If we didn't keep records, there would be no records to beat, no incentive to improve on past showings and no accurate information on which to base the relative attention we should be paying to various kinds of accidents. Our safety organizations would find it very sad going and would lack interest and enthusiasm. Statistics provide a medium through which we can create competition between plants, departments and individuals and, if for no other purpose than this, they would be worth much more than they cost.

"Sustained safety work requires enthusiasm. There is no substitute for it and the easiest way to work up enthusiasm is to base your campaign on statistics.

"Doesn't it make you proud when comparing your record with the other plants to see that you are in the lead or near the head of the list? No matter how or what a man may be doing he always takes more interest when he knows he is in the lead, or at least is heading in that direction.

"The tendency on the part of many is to look upon the safety engineer as the person whose responsibility is to prevent accidents. The safety engineer's work may be compared with yeast in bread. You certainly would not want to eat bread baked without yeast. The function of the yeast, however, is merely to set the dough working and it is the safety engineer's job to stir us up on the subject of safety and produce activity on the part of the entire organization.

"It is you and I who must prevent accidents. Statistics will show the number of errors. That's what an accident is. If the reports are carefully made up they will show us the direction in which we have to pull to avoid repetition of our past mistakes. Then we are fortunate in receiving from the Association each month a list of accidents occurring in other plants and we must take full advantage of the opportunity to use these as a preventive of the same difficulty in our own surroundings.

"Cement companies, like all business organizations, are continually struggling to survive. Individual dollars and cents must be saved. Material and man power must be economized and production speeded up. The average executive is normally sentimental but he is abnormally practical. That's why he is a business manager. He is interested heart and soul in making the business a huge success and if we can help him by reducing accidents we will have touched the chord that rings closer to him than any other. Efficiency and economy are the strong factors in battling competition. Safety, efficiency and economy are all very nearly synonomous. Speaking accurately we can't have

F. H. Sass

any one of the three without the other. The work that is extravagant with time and material is likely to be extravagant with human life and the reverse is equally true. This suggests that without depreciating the value of our safety campaign in the least we, no doubt, have opportunities at the same time to teach employees the benefits of economy of time and material.

"Each year must show a profit if the employer is to continue in business and we are to retain our jobs. The endeavor for

continuous economy doesn't become old as seems to be the case with safety interest on the part of some people. Keep safety uppermost in your mind and teach it to your men. Then along with that message carry the idea of economy, first of man power, second of time and third of the material things with which we deal."

On New Employees

Frank H. Sass, who is in charge of the employment of labor at the plant of the Universal Portland Cement Co., at the Buffington, Ind., plant, made the following observations in opening the round table discussion on "Instruction and Protection of New Employees":

"Bear in mind the fact that every applicant at your employment office is a human being and should be treated as such.

"Applicants have different methods of approach; some come in and state what they have been doing and ask in a straightforward manner for work. The next applicant slides in and glances around very much ill at ease and has the appearance of being embarrassed in asking for work. Following him is the man that only has a smattering of the English language and who answers 'yes' to every question you may ask him and so on through the various types.

"Still it is necessary to hire men for the plant so the best of the applicants are picked and hired.

"Then comes your opportunity to impress the new employe that accidents are preventable. Take an interest in them right there as they are going to be employes in your plant.

"You have a general idea as to what this new employe's duties are going to consist of. Make his job as clear to him as you possibly can so that there will be nothing mysterious to him and his mind will not be in a muddle when he reports to his foreman.

"Tell him what the organization is trying to accomplish through accident prevention. Instill in his mind that in becoming a member of the plant organization it is up to him to take an active part in the prevention of injuries to anybody wherever he may be.

"Instruct him to say hello or good-morning to his foreman and fellow-workers when he reports at the beginning of the turn; this with a smile goes a long way in starting the daily task correctly.

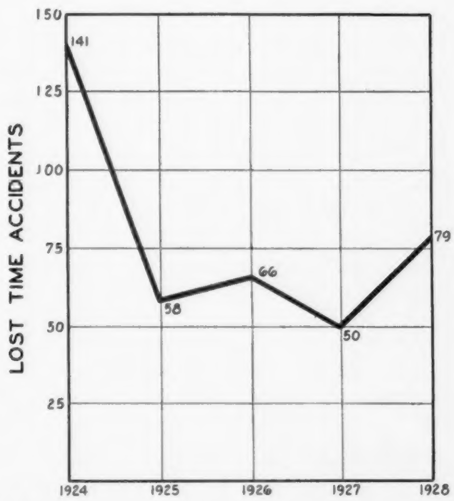
"See that he understands that he is to report to the dispensary and his foreman at once whenever it is necessary whether it is for a scratch or due to sickness.

"Have him understand that his foreman is his advisor and that he should talk to him whenever he is doubtful as to the proper way to perform certain duties; never take a chance.

"Be truthful and straightforward in your dealing with this new employe and see that in accepting the job, he understands that it is up to him to abide by the rules and regulations in force at the plant.

"After you have given him a true insight of what is expected of him, pass him on to his foreman who will continue his education.

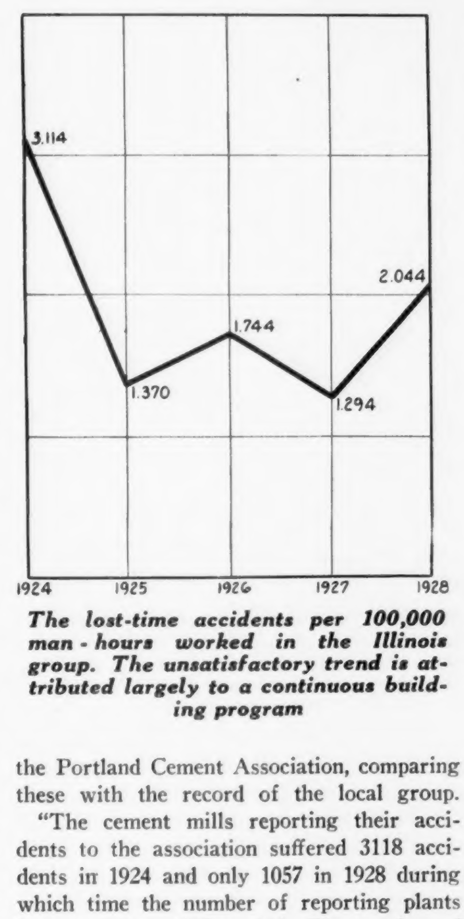
"These new employes are of different nationalities, color, temperaments, etc., but remember they are human and have their problems to solve, their worries, and everything else the same as you and I."



Lost-time accidents in the Illinois group of mills for the past four years

Reports Compared

A. J. R. Curtis, secretary of the committee on accident prevention of the Portland Cement Association presented an analysis of the accident record of plants reporting to



The lost-time accidents per 100,000 man-hours worked in the Illinois group. The unsatisfactory trend is attributed largely to a continuous building program

the Portland Cement Association, comparing these with the record of the local group.

"The cement mills reporting their accidents to the association suffered 3118 accidents in 1924 and only 1057 in 1928 during which time the number of reporting plants increased from 105 to 144. The number of lost time accidents per 100,000 man-hours worked dropped from 35.5 in 1924 to 11:17 in 1928, which is certainly an astonishing record.

"There are eleven mills represented here today, four in Illinois, three in northern Indiana and four in eastern Missouri. Ten of these eleven mills have reported to the association for a long period and one started reporting in 1928. These ten plants referred to suffered 388 lost time accidents in 1924 and only 103 in 1928, a reduction for the group which is fully as fine, if not a little finer, than that for the industry as a whole.

"Four of these ten mills located in Missouri made an unusual record during the past five years. During 1924 this group suffered 227 lost time accidents. The number recorded against these same mills in 1927 was 57 and in 1928 the number dropped to 12, an average of only four per mill as compared with the general average for the country which was about 7 accidents per mill in 1928. One of these mills got through without accidents and won the Association trophy.

"Now I come to the unpleasant duty of commenting on the record of the Illinois mills. There are four of them and for the last five years they have had the advantages of the regional safety meetings held here, close to home where their attendance could be large without involving traveling expense; they are operated by progressive companies and enjoy good and alert management. But as a group they haven't been making the definite progress which the other groups are making. In 1928 the Illinois mills suffered 58% more accidents than during 1927. The accompanying curves tell the story.

"What is there to do about it? Briefly I would suggest that these mills:

"(1) Report each accident more completely and analyze each accident more carefully.

"(2) Make the most of our present program of first aid training by enrolling 100% of your working force.

"(3) Get into the June no-accident campaign in earnest. Last June the Illinois mills were responsible for five accidents during June while the country as a whole, with 36 times as many mills in operation only suffered ten times as many accidents.

"(4) Organize to win the Association trophy. No Illinois mill has yet won a trophy and there is a splendid opportunity for the mill that will organize in earnest and carry off the big monument. Mr. Greer is going to tell you how to accomplish the result. I know that no Illinois mill will admit that Cape Girardeau mill is able to put over any thing which you Illinoisians can't."

President Gorman Proves Safety Booster

After a day of continuous busy safety sessions attended by 161 men of the mill operating organizations and over 30 guests, the annual safety dinner proved a very refreshing period. Two hundred ten persons

sat down at the table. Entertainment was furnished by the Four Nighthawks of Chicago. Henry McClarnan, general superintendent of the Alpha Portland Cement Co., presided as toastmaster and the address of the evening was made by James E. Gorman, president of the Chicago Rock Island and Pacific Railway, who journied to La Salle for the occasion.

Throughout his address, enlivened by frequent anecdotes from his 51 years of rail-

James E. Gorman

road experience, Mr. Gorman revealed his intense interest in the safety movement. He said in part:

"From the viewpoint of this executive, safety always pays. This conclusion and statement prompted and supported by an abundance of available data.

"Safety is an asset, an investment that brings pleasing returns, not alone from a financial point of view, but more important, because of the noticeable benefits it brings to the men in industry, including the railroads, to their homes and families, to communities, to the state and to the nation.

"Interest in safety must emanate from the highest officer in direct charge of the entire property, and through his subordinates must be passed along down the line to each and every officer and employe.

"Luke warmness and half way interest will not convince of one's earnestness in this great humanitarian work. The stand for safety must be definitely taken and just as definitely announced. When this is done interest will be taken and results achieved.

"Human interest must be appealed to, individual responsibility stressed and its acceptance insisted upon. No movement will progress beyond capable leadership and to accomplish results in safety, the man in charge must be imbued with the safety spirit and he must plant and cultivate this same spirit in the minds of his subordinates.

"The American railroads were pioneers in organized safety and because of the interest taken and manifested on the part of management and employes, results were early obtained in accident reduction and prevention, that gave conclusive proof that the movement was needed, was worth while and had before it possibilities for advancement and ultimate success.

"May we not unite our efforts to reduce accidents at railroad-highway grade crossings to the lowest possible mark and emphasize this feature of accident prevention as one of the most important confronting us today?

"The needless loss of life and limb still presents a problem that must be solved and to solve it intense interest in safety must be manifested by executive officers and cooperation from subordinate officers and employes generally, insisted upon, and if necessary proper action taken to insure such assistance."

Guests of Honor

O. M. Benson, executive secretary, Illinois Valley Manufacturers Club, La Salle, Ill.
Hon. Joseph Brzygot, mayor of La Salle, Ill.
Edward Carus, president, Carus Chemical Works, La Salle, Ill.
F. C. Dettelbach, Utica Hydraulic Cement Co., Utica, Ill.
Stuart Duncan, president, La Salle State Bank.
J. M. Egan, general agent, Illinois Central R. R., La Salle, Ill.
J. L. Ewing, general agent, Illinois Central R. R., Oglesby, Ill.
W. W. Greaves, M. D., La Salle, Ill.
F. L. Hackman, chairman, safety committee, Illinois Valley Manufacturers Club.
H. E. Hackman, general manager, Western Clock Co., La Salle, Ill.
Hon. Albert Hasse, mayor of Peru, Ill.
A. J. Hoskin, editor, *Pit and Quarry,* Chicago.
Hans G. Jacobsen, Bates Valve Bag Corp., Chicago, Ill.
Prof. A. H. Karn, superintendent of schools, Peru, Ill.
H. H. Martin, agent, Chicago, Rock Island and Pacific Ry., La Salle, Ill.
Prof. N. M. Mason, superintendent of schools, Oglesby, Ill.
J. B. McCaffery, general manager, L. S. & B. C. R. R. Co., La Salle, Ill.
A. J. McKay, president, Matthiessen and Hedger Zinc Co., La Salle, Ill.
Prof. J. B. McManus, superintendent of schools, La Salle, Ill.
George W. Mundie, president, Mundie Manufacturing Co., Peru, Ill.
B. H. Rader, vice-president, Lehigh Portland Cement Co., Chicago.
J. L. Rock, M. D., Oglesby, Ill.
Nathan C. Rockwood, editor, ROCK PRODUCTS, Chicago.
L. F. Shedd, safety superintendent, Rock Island Lines, Chicago.
W. A. Shields, secretary, La Salle Chamber of Commerce.
Hon. Charles Spur, mayor of Oglesby, Ill.
O. A. Steller, editor, *Concrete,* Chicago.
Charles Sweger, secretary, safety committee, Illinois Valley Manufacturers Club, La Salle, Ill.
C. C. Swift, general manager, La Salle County Carbon Coal Co., La Salle, Ill.
Charles A. Wagner, president, Illinois Valley Foremen's Club, La Salle, Ill.
O. G. Vale, agent, Chicago, Milwaukee and St. Paul Ry., Oglesby, Ill.
H. W. Vroman, agent, Burlington Route, La Salle, Ill.

Committee of Arrangements

John Young (Lehigh), chairman.
Henry McClarnan (Alpha).
Richard Moyle, Sr. (Marquette).
W. E. Gorg (Missouri).
W. E. Wuerth (Sandusky).

Reception Committee

John J. Kelly (Marquette), chairman.
S. A. Kidd (Lehigh).
Stuart Smith (Lehigh).
C. M. Butler (Marquette).
J. F. Lawnicdak (Alpha).

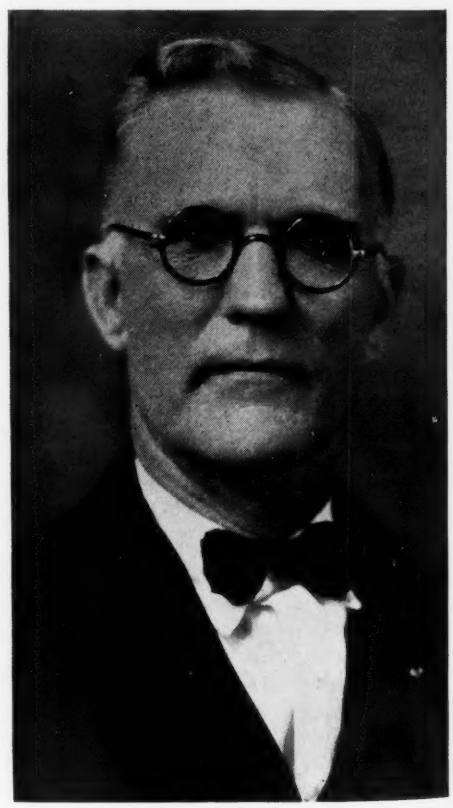
Registration of Cement-Mill Men

Alpha Portland Cement Co., La Salle

N. J. Bird, draftsman.
H. H. Brewer, plant engineer.
Anton Brush.
V. T. Byrne.
William Dobbershin, crane operator.
George Donaldson, clerk.
J. M. Franks, chief engineer.
Dominic Geraci, crusher operator.
R. K. Gimson, assistant chemist.
John S. Grzybowski, physical tester.
Daniel Hall.
F. B. Hamilton, plant chemist.
Joseph C. Kaszynski, mill foreman.
Charlie Kielter.
Anton Kraly.
Joseph F. Lawnizcak, storekeeper.
Gus Lundberg, superintendent.
Frank Marine.
John Martini, foreman.
Henry McClarnan, general superintendent.
Lester W. Morrow.
Ed. Mosier.
Patrick Murphy, quarry foreman.
Harry L. Noel.
A. Oklcen.
Stewart Pickett.
Frank Peitruka.
Mike Pizzutte.
John L. Reinhart, chief clerk.
Henry Rosenke, kiln burner.
Joe Ruva, quarry.
Martin Setince.
Ignatius Sment.
William Sueltz.
J. W. Temm, chief electrician.
N. J. Tesch.
S. Tomaszewski, shift foreman.
Stanley Wavrzyniak.
Joseph Wojenchowski.
Roman Wojenchowski.

Alpha Portland Cement Co., Alpha, Mo.

E. G. Hammer, electrician.
Henry Scherft, foreman.



R. C. Matthews

Atlas Portland Cement Co., Hannibal, Mo.

Charles F. Colley, assistant plant engineer.
George Kilian, foreman.

Lehigh Portland Cement Co., Oglesby, Ill.

John Allwood, safety inspector.
Thomas Allwood, repairs.
Charles Anizius, kiln burner.

Joseph Avila, machinist.
J. J. Bassett, engineer.
John Cantergiani.
Joe L. Cavaletto, shipping clerk.
Peter Corgitt, truck driver.
Right Corless, pipe fitter.
Frank Daniels, mill foreman.
H. G. Deibert, kiln burner foreman.
Max Donatt, electric shop.
John Dusak, fireman, coal house.
Harry Ebenoe.
Charles Elbert.
Frank Frank, machine shop.
James Gallo, assistant timekeeper.
Steve Gulaska, repairs.
C. D. Harbison.
Carl J. Herrick, foreman.
Jess Hurst, clerk.
Joe Julian, cost foreman.
Robert Kidd, foreman.
S. A. Kidd, chief clerk.
Emil Koehl.
Joe Korte, bag-house foreman.
Joe Lennox, machinist.
R. D. McElhaney, quarry foreman.
James Maszette, rigger.
Adam Miller, foreman.
Henry Murdock, foreman.
Frank Nadvesnik, foreman.
Joe Ostrovshi.
Denis Salina.
Stanley Sitar, power house.
John Smania, foreman.
Dewey Sroberts, quarry.
Dusan Svrobuch, switchman, quarry.
Bert Taylor, foreman.
Burt Taylor, assistant electrician.
William Vester.
John Young, superintendent.

Marquette Cement Manufacturing Co., La Salle, Ill.
E. H. Alexander, engineer.
Sydney Barr, Jr.
Perry Bartram, engineer.
F. Baumgardner, engineer.
Charles Beckham, foreman.
Edward Bonacorri.
Frank Brovelli, quarry.
John Bunzell, repairman.
C. M. Butler, chief chemist.
Peter Christi.
J. A. Confrey, engineer.
William M. Corless, electrician.
Alex Dodd, foreman.
Thomas Hancock, quarry.
A. C. Hebel, employment manager.
Peter Hopkins, iron worker.
Gus. John.
Roy Kellems.
J. J. Kelly, manager of industrial relations.
W. M. Kimbel, assistant storekeeper.
H. R. Kerrick, loading floor.
Hugh McCann, foreman.
E. M. MacDonald, foreman.
John MacDonald.
John Meinardus, foreman.
James P. Mennem, sack house.
Charles Moreheiser.
William Moyle, Jr.
T. Roderick Noon, chief engineer.
Joseph Pekula, sheet metal.
Garfield Peters.
Dr. John L. Rock, plant surgeon.
William H. Sawers, engineer.
George Schmigrotz.
Theo. Shedd, yard.
James Sicalionini, foreman.
Stanley Smith.
William Spurr, assistant mine superintendent.
John R. Lauscher, machinist.
John Treganing.
John C. Warmington, foreman.
W. H. Welch, electrician.
Simon Zomboruszy, quarry.

Marquette Cement Manufacturing Co., Cape Girardeau, Mo.
M. P. Greer, safety engineer.
R. C. Matthews, plant superintendent.

Missouri Portland Cement Co., St. Louis, Mo.
D. B. Coleman.
A. F. Diedrich, chief electrician.
W. E. Gorg, assistant treasurer.
G. M. Hasen, foreman.
E. C. Jarman, foreman.
Fred Knickel, mill foreman.
James Phillips, assistant superintendent, quarry.

Sandusky Cement Co., Cleveland, Ohio
E. W. Carlson, engineer.
W. M. Powell, safety director.

Sandusky Cement Co., Dixon, Ill.
C. A. Buchner, foreman.
George E. Cornelius, chief engineer.
C. B. Fowler, chief chemist.
J. E. Johnson, electrician.
R. J. Joyce, clerk.
James McConnell.
Phillip Mooney, plant engineer.
Charles Popp.

Universal Portland Cement Co., Buffington, Ind.
E. W. Baumeister, operating foreman.
E. O. Elliott, superintendent mills Nos. 3 and 4.
J. A. Fish, packing foreman.
A. E. Freudenreich, superintendent, No. 6.
William Hennebohle, master mechanic.
J. B. Lewis, assistant general superintendent.
John O'Neil, mechanical foreman.
F. H. Sass, supervisor of safety and labor.
August Schroeder, harbor master.
C. E. Stromquist, operating engineer.
R. B. Thrush, mechanical foreman.
C. M. Williams, operating foreman.

Miscellaneous
W. H. Bennett, chief engineer, M & H Zinc Co.
A. J. R. Curtis, Portland Cement Association.
F. C. Dettlebach, president, the Utica Hydraulic Cement Co.
F. L. Hackman, superintendent industrial relations, Western Clock Co.
H. E. Hackman, general manager, Western Clock Co.
A. J. Hoskin, editor, *Pit and Quarry*, Chicago.
H. G. Jacobsen, Bates Valve Bag Corp., Chicago.
David McCrindle, superintendent, Matthiessen and Hedger Zinc Co.
Alex U. Miller, associate mining engineer, U. S. Bureau of Mines, Vincennes, Ind.
Herman Rietgraf, foreman, Illinois Valley Sash and Door Co.
S. G. Seaton, chemist, Utica Hydraulic Cement Co.
A. J. Shoemaker, representing E. I. du Pont de Nemours and Co.
James Sinden, supt., Utica Hydraulic Cement Co.
A. C. Skilton, supt., Mine Rescue Station.
C. C. Swift, general manager, La Salle County Carbon Coal Co.
Henry F. Wachter, Illinois Valley Sash and Door Co., Peru, Ill.
Charles A. Wagner, president, Illinois Foremen's Club, Western Clock Co., La Salle.
Ralph H. Woods, M. D., La Salle, Ill.

Missouri to Use a Million Barrels of Cement on Road Work

THE Missouri state highway commission at Jefferson City has opened 14 bids for its portland cement requirements during the coming year. All the large cement manufacturers of St. Louis, Hannibal and Kansas City and companies with proper rating in Kansas submitted bids. The department plants to purchase approximately 1,100,000 bbl. in the construction year.

This Plant Is Enrolled

in the

1929 Safety Trophy Contest

of the PORTLAND CEMENT ASSOCIATION

RULES

1 The Portland Cement Association safety trophy for 1929 shall be awarded to each member plant with a perfect safety record during the calendar year. The name of the winning plant and the year in which won will be inscribed on each trophy awarded.

2 In case the contest is won by a plant having previously received the trophy, recognition shall be given by placing an additional inscription on the trophy previously presented, rather than by awarding an additional trophy.

3 Only lost time accidents or those involving death or permanent disability shall be considered in determining a perfect safety record. A lost time accident is defined as one to which the injured loses more than the remainder of the shift or day in the course of which the accident occurred.

4 In determining whether accidents are chargeable to plant, the judges shall be guided by the rulings of the various compensation boards.

1927 Trophy Winners

Alpha Portland Cement Co.	Plant No. 3, Martin's Creek, Pa.
Alpha Portland Cement Co.	Ironton, O.
Canada Cement Co., Ltd.	Belleville, Ont.
Canada Cement Co., Ltd.	Hull, Que.
Cowell Portland Cement Co.	Cowell, Calif.
Kansas Portland Cement Co.	Bonner Springs, Kansas
Lehigh Portland Cement Co.	Plant No. 3, New Castle, Pa.
Lehigh Portland Cement Co.	Iola, Kansas
San Antonio Portland Cement Co.	San Antonio, Tex.
Universal Portland Cement Co.	Duluth, Minn.

RULES

5 Only plants promptly reporting accidents and making annual reports of man-hours worked shall be eligible to compete.

6 In order to qualify in the competition, plants must be in operation an aggregate of at least six months of the year.

7 The trophy award to winning plant or plants shall be made at the spring meeting of the Portland Cement Association. Formal presentation shall be made to two delegates chosen from the employes of the winning plant or plants and all the expenses of these delegates in attending this meeting shall be paid by the Association as a part of the prize.

8 The trophy shall be placed in a safe and conspicuous place at the winning plant or plants where employes may see it as often as possible.

If You Work Safely WE CAN WIN!

The new safety poster gotten out by the Portland Cement Association lists the 1928 winners and pictures the trophy

Indiana and Kentucky Mills Plan Better Records

Annual Safety Meeting at Louisville March 5

IF PLANS discussed at the Louisville regional safety meeting of the Portland Cement Association bear fruit, a large reduction in accidents among the mills of that vicinity may be expected in 1929. This meeting held in the Kentucky hotel on March 5, exceeded considerably last year's attendance of the same group at Indianapolis. The primary subject of discussion was how to apply safety ideas in the mills, the consensus of opinion being that a general program of education was the most effective method. The most specific idea expressed along that line was to prove the needlessness of accidents. To those who are firmly convinced that accidents are unnecessary they become intolerable and if the entire mill force gets this viewpoint accidents vanish.

H. D. Baylor, works manager of the Louisville Cement Co., acted as chairman, local details being handled by A. E. Snodgrass, safety director of the Louisville company. The following cement mills cooperated in the meeting: Kosmos Portland Cement Co., Kosmosdale, Ky.; Lehigh Portland Cement Co., Mitchell, Ind.; Lone Star Cement Co., Indiana, Greencastle, Ind.; Louisville Cement Co., Speed, Ind., and the Southwestern Portland Cement Co., Osborn, Ohio.

The program was as follows:

MORNING SESSION—10:00 A. M.

Call to order—Chairman, H. D. Baylor, works manager, Louisville Cement Co.

Welcome—Hon. W. B. Harrison, mayor of Louisville.

Progress report—A. J. R. Curtis, assistant to general manager, Portland Cement Association.

Quarry accidents and the explosive hazards—H. M. Hamilton, E. I. du Pont de Nemours and Co., Wilmington, Del.

LUNCHEON—12:00 NOON

Invocation by Rev. John M. Vander-Muelen, D. D., president, Louisville Theological Seminary. Henry S. Gray, secretary-treasurer, Louisville Cement Co., presiding.

Guest of honor—J. G. Ellis, American Woolen Co., Louisville, Ky.

AFTERNOON SESSION

Call to order—1:15 p. m.—H. H. Purkhiser, assistant superintendent, Lehigh Portland Cement Co., Mitchell, Ind., chairman.

Paper—Albert Shuey, chairman, safety committee, Lone Star Portland Cement Co., Indiana, Greencastle, Ind.

Discussion by plant representatives: Crumpton, Louisville; Kirp, Kosmos; Cornelius, Southwestern (Osborn); O'Callaghan, Lone Star; Jacobsen, Bates Valve Bag Corp.

Does accident prevention pay?—F. W. Rodenheber, manager, Louisville Safety Council.

What is the object of our safety work?—W. H. Weitknecht, superintendent, Lehigh Portland Cement Co., Mitchell, Ind.

Demonstration by first-aid teams of: Lone Star Cement Co. Indiana, Greencastle, Ind.; Lehigh Portland Cement Co., Mitchell, Ind.; Louisville Cement Co., Speed, Ind. Followed by discussion by J. F. Davies, U. S. Bureau of Mines, Vincennes, Ind., and Captain Loran of the Louisville police force.

EVENING

DINNER—6:30 p. m.—W. H. Weitknecht, superintendent, Lehigh Portland Cement Co., Mitchell, Ind., presiding.

Guest of honor—Dr. Charles W. Welch, pastor, Fourth Ave. Presbyterian Church, Louisville, Ky.

Song leader—A. N. Palmer (Lehigh). Music.

Registration

Kosmos Portland Cement Co., Kosmosdale, Ky.

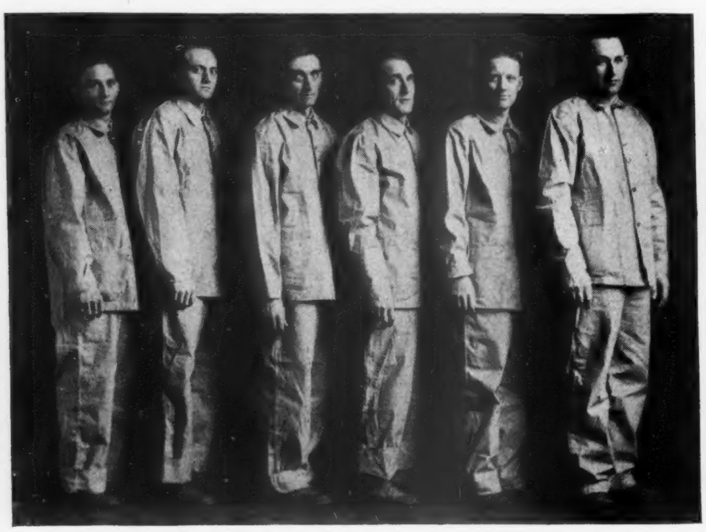
Allen Achars, mill runner.
Willie Algood.
Ben Allgood, Jr., electrician.
Harry Anderson, chief electrician.
Maurice Brown, assistant foreman.
Ambrose Celletti, stone dryer.
D. P. Dorict, day electrician.
H. A. Downs, construction foreman.
L. A. Downs, night electrician.
H. W. Graybill, chief engineer.
J. M. Hedden, second shift foreman.
Ernest Henderson, construction.
John H. Hendricks, bag-house foreman.
B. F. Hoffman, repair foreman.
J. M. Hopgood, machine shop.
Virgil Jameson, assistant foreman.
Heron Jones, tube mill operator.
Jesse Karr, raw mill.
George L. Kirp, supervising chemist.
Pete McHolland, repairman.
Hugh Marcum, kiln burner.
Tom Musselman, shift foreman.
G. M. Richter, finishing.
G. M. Rodgers, labor foreman.
Howard Samuels, machinist.
Maywood Shaffer, foreman.
J. H. Smith, kiln-room foreman.
F. G. Tiedemann, purchasing agent.
Everett Triplett, in charge preliminary bins.
R. S. Triplett, storeroom clerk.
W. H. Wardrip, carpenter.

Lehigh Portland Cement Co., Mitchell, Ind.

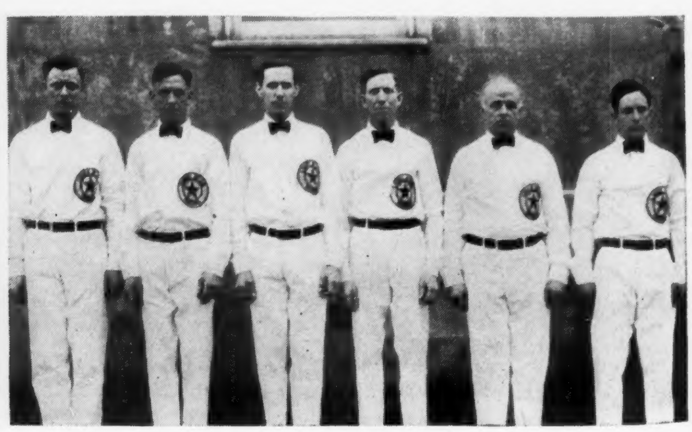
J. D. Byrne, company surgeon.
William Briscoe, mill foreman.
Carl E. Chastain, machinist.
Dearl E. Cooper, labor.
Clarence Cox, electrician.
Arvil Dalton, blacksmith.
William Franksley, mill foreman.
Frank M. Haverly, electrician.
Orda Krutsinger, timer.
Lawrence McDermed, quarry.
Claude Moore, machinist.
Floyd Nolan, common labor.
A. N. Palmer, chief clerk.
H. H. Purkhiser, assistant superintendent.
William E. Quigley, machinist.
Ernest L. Root, sheet-metal work.
J. B. Sims, general foreman.
Walter Stroud, shop foreman.
W. F. Weidner, quarry foreman.
W. H. Weitknecht, superintendent.

Lone Star Cement Co. of Indiana, Greencastle, Ind.

George W. Billingsley, mix chemist.



First aid team of the Lehigh Portland Cement Co. plant at Mitchell, Ind.



First aid team of the Lone Star Cement Co. of Indiana

Otis English, mill foreman, quarry.
James P. Frew, construction foreman.
Herschel Jones, pack-house.
Henry Koessler, quarry foreman.
Frank Lane, mill foreman.
John O'Callaghan, assistant superintendent.
Carl Shoemaker, machinist.
Albert Shuey, chairman, safety committee.
Ross Torr, electrician.

Louisville Cement Co., Speed, Ind.
George Appell, sub-foreman brixment packing.
H. D. Baylor, works manager.
Harry J. Bottorff, foreman.
Warren Bottorff, general foreman.
J. M. Buchheit, superintendent of quarries.
F. H. Compton.
William Cooley, Sr., shale-quarry foreman.
Homer G. Dixon, sheet metal.
Jesse G. Dorsey, recreational manager.
Albert Doughty.
Fred Enders, powder foreman.
George Enders, track foreman.
Joe Enders, assistant foreman bag department.
O. C. Fleming, yard master.
Pink Gramner, laborer.
C. Floyd Grosbach, carpenter.
J. C. Hall, powder man.
Alonzo Hanger, chief chemist.
Martin Hecker, foreman.
James Hinnebaugh, foreman, sheet metal.
Thomas Hinnebaugh, assistant pack foreman.
Robert Hinton, power foreman.
James Huckelberry, blacksmith.
Fred Keller, night mill foreman.
J. Harry Lemon, superintendent, Milltown, Ind.
Thomas McDonald, construction engineer.
William Pass, general mill foreman.
A. Pennington, laborer.
Herman Popp, steamfitter foreman.
Robin Proctor, assistant superintendent, Milltown.
Charles Regan, assistant machine shop foreman.
Harry Regan, general foreman quarries.
A. F. Renz, boiler foreman.
Fred Renz, boilermaker.
A. W. Riggle, construction foreman.
Earle Riggle, assistant electrical foreman.
Jesse Riggle, chief electrician.
Harold E. Schoonover, assistant superintendent of quarries.
E. E. Seibel, general foreman.
A. D. Snodgrass, director of safety.
Victor Stockdell, foreman.
Chester Stone, engineer.
C. O. Stoner, shift foreman.
Charles W. Swartz, assistant foreman, packing department.
Lester M. Townsend, carpenter foreman.
Earl Turner, kiln room.
Claude Wells, repair foreman.
John E. Wells, painter foreman.
Albert Wendriths, machine-shop foreman.
Charles Werle, kiln burner.
Roland Whitney, purchasing agent.
Otto Whitesides, stock clerk.
J. G. Williamson, plant chemist.
D. E. Willingham, plant engineer.

Southwestern Portland Cement Co., Osborn, Ind.
J. W. Cook, chairman, safety committee.
O. R. Cornelius, auditing department.

Miscellaneous
A. J. R. Curtis, Portland Cement Association.
J. F. Davies, assistant mining engineer, Bureau of Mines.
H. M. Hamilton, E. I. du Pont de Nemours and Co.
J. G. Ellis, American Woolen Works.
H. G. Jacobsen, Bates Valve Bag Corp.
W. B. Harrison, mayor, Louisville.
Capt. Loran, captain of police.
F. W. Rodenheber, manager, Louisville Safety Council.
John L. Vander Muelen, president, Louisville Theological Seminary.
Dr. C. W. Welch, Fourth Avenue Presbyterian Church.

Monolith Midwest Cement Making Shipments

REGULAR SHIPMENTS of cement now are being made to all parts of the mid-continent territory, embracing Wyoming, Colorado, Western Kansas, Nebraska and contingent sections, from the new $2,000,000 plant of the Monolith Portland Midwest Co. near Laramie, Wyo.

Both the Monolith Portland Midwest Co. and the Monolith Portland Cement Co. of California have the same officers, namely, Coy Burnett, president; C. A. Low, vice-president and general manager; J. J. Calkins, secretary and treasurer; T. R. Larson, assistant to the president; W. S. Trueblood, producing manager, and H. C. Gardner, director of sales, securities department.

The Laramie plant is adjacent to the main line of the Union Pacific railroad and the Denver-Laramie highway, 2½ miles east of Laramie, and is in the immediate vicinity of the company's raw material deposits. These valuable deposits comprise 2950 acres and are said to include sufficient raw material to supply needs for hundreds of years.

A crew of men was kept continuously at work for more than a year in the construction of the plant, which is said to be one of the finest and most modern cement mills of the kind in the world. It was designed and erected by F. L. Smidth and Co., cement plant engineers of New York. Crushing and grinding of rock, the first step in the manufacture of cement, was started early in January, and production operations now are in full swing, with regular shipments of finished products being made.—*Los Angeles* (Calif.) *Express.*

First aid team of the Speed, Ind., plant of the Louisville Cement Co.—J. Miller, P. Cleveland, K. Kramer, J. Stewart, C. Seilbel and A. Boyd

Urschel Lime and Stone Co. Plant Threatened by Fire

A FIRE of unknown origin threatened to destroy the plant of the William Urschel Lime and Stone Co. at Gibsonburg, Ohio, on the evening of February 15, but the arrival of fire-fighting equipment from neighboring towns together with a fortunate wind which kept the flames from the main structure resulted in confining the flames to some of the outer buildings. The loss was estimated at $25,000, and it was reported that this was covered by insurance.

The fire was first discovered in the building used for drying, in which was also stored about 25,000 paper sacks as well as other inflammable material. A power plant nearby was damaged and for a time the blaze threatened the main plant. A gasoline switch engine, owned by the company, was ruined by the fire before it could be gotten out of the path of the flames. Because of the danger of spreading throughout the whole plant, the fire departments of other towns near Gibsonburg were called to aid the local company in fighting the blaze.

Iowa Sand and Gravel Corp. Expanding Operations

CAPACITY of the Eddyville plant of the Iowa Sand and Gravel Corp., will be more than doubled when the $50,000 worth of improvements and repairs now in progress are completed, according to F. W. Wright, who is in charge of the Eddyville plant.

The new dewatering plant, a mile upstream from the main plant, has been dismantled and is being rebuilt to accomodate the installation of additional equipment. Two new 40-ft. Swintek screen nozzle ladders and a second new 10-in. Morris pumping unit are being added.

Another new 8-in. pump has been installed to carry away the surplus sand and will force the waste through a new 1000-ft. down stream pipe line. Additional electric motors, including one 250-hp. unit, and five smaller units, have been purchased for the plant.

Reconstruction of the entire upstream plant has been required in this enlargement program. This plant is connected with the main plant by an industrial railroad and the final washing, grading and finishing of the products are done at the main plant.

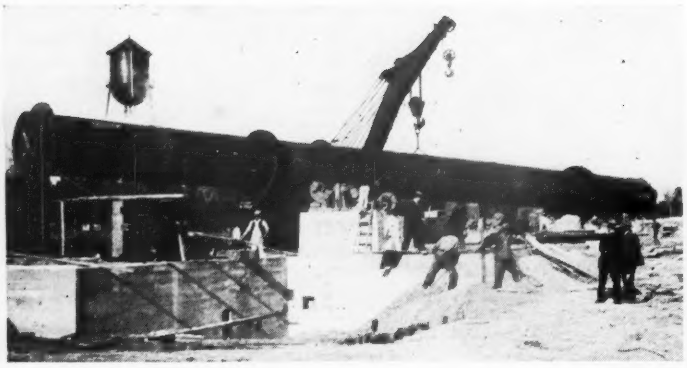
Production of the Eddyville plant will be more than doubled in the expansion program. The Eddyville plant shipped some 3000 cars of gravel and sand last season and the biggest year in the history of the firm is in prospect for 1929. An estimated daily output of 30 to 40 cars is planned.

The plant is the largest in southern Iowa and is the principal source of supply of building materials used in street and highway construction in this section of the state. The firm now has contracts for supplying materials for a dozen or more large paving jobs.—*Oskaloosa* (Ia.) *Herald.*

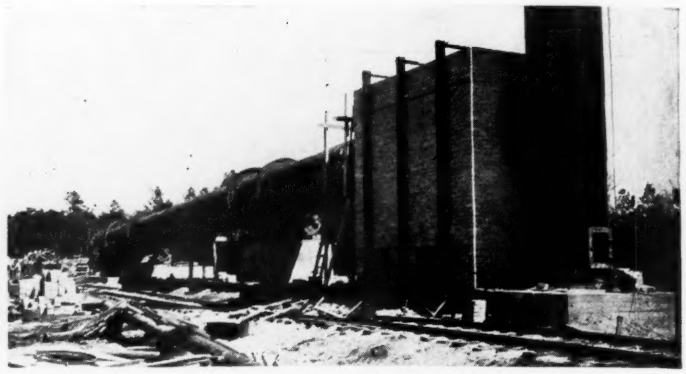
Plant of Raleigh Granite Co. at Greystone, N. C., Damaged by Fire

A FIRE LOSS of $30,000 or more was reported from a fire which occurred during February at the Greystone quarry of the Raleigh Granite Co., Raleigh, N. C., four miles north of Henderson, N. C. The Henderson fire department answered the call and fought the blaze for three hours in a biting cold temperature before they finally got it under control.

The fire is supposed to have started from a faulty electric switch. It ran through the main crusher building and practically destroyed the wood frame work of the structure. The machinery in the crusher house was also damaged.—*Raleigh* (N. C.) *News and Observer.*



Installing the big kiln at the Haden lime plant at Houston, Tex.



The kiln in place, showing the details at the stack base

Work on Haden Company Lime Plant at Houston Progressing

THE accompanying views show the progress of the work on the new lime plant of the Haden Co. of Houston, Texas. These views were left with ROCK PRODUCTS by Cecil R. Haden, who was a recent visitor in the editorial offices. Mr. Haden is now in the north to consult with Arnold and Weigel, the engineers of the new plant, and also to study sand and gravel operations in this part of the country because his company has recently taken over a sand plant about 100 miles from Houston and is going to operate it in conjunction with the company's general material business.

The kiln for the new oyster-shell lime plant has now been set in place and the plant will be operating in a couple of months, although all the construction will not be completed by that time. The kiln is a 7x125-ft. rotary Traylor unit.

Glens Falls Converting Whole Plant to Make Quick-Hardening Cement

WHILE MANY MANUFACTURERS are asking, "What's wrong with business?" the Glens Falls Portland Cement Co., Glens Falls, N. Y., is installing new machinery and other equipment in its plant at a cost of between $250,000 and $300,000 for the manufacture of "Iron Clad Velo" quick-hardening portland cement.

With the installation of this equipment the company will operate the mill entirely on the new product for periods, and at other times will continue to turn out the "Iron Clad" portland cement.

The present expenditure makes the total spent for improvements to the plant during the past few years more than $2,000,000.

During a trip to Europe in 1927, George F. Bayle, Sr., president of the company, obtained the exclusive rights for the new product in the Eastern States. The manufacture of "Iron Clad Velo" was started late in that year and has since been continued. The new cement proved so popular that it was necessary to install new machinery to manufacture it in sufficient quantity to meet the demand. Because of the special process of making "Iron Clad Velo" different machinery than that used in the manufacture of the "Ironclad" portland cement is necessary.

Manufacture of the product in larger quantities will reduce the cost of production and enable the company to sell it at a lower figure, besides increasing the demand for it through the reduced price.

"In these days of progress and efficiency it is the policy of this company to keep up-to-date, so we can manufacture as well and as cheaply as our competitors," said Mr. Bayle.—*Glens Falls* (N. Y.) *Post-Star.*

Solvay Process Co. Extends Quarry Holdings

ACQUISITION of 119 acres of valuable water frontage on the Chaumont river from the Adams and Duford Co. of Chaumont, N. Y., has been completed by the Solvay Process Co. of Syracuse.

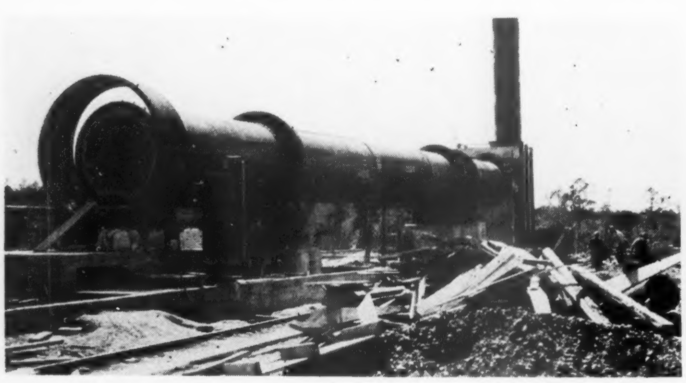
This property consists of the original Gaige quarries along the Chaumont river toward Depauville and gives the Syracuse firm long sought facilities for loading its own boats on its own property. Private sidings for the loading of stone will also be available now.

Stone crushing operations on the extensive Solvay holdings will be begun this spring.

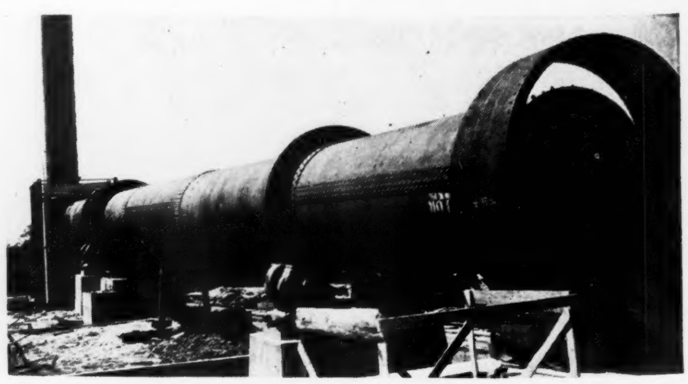
The Adams and Duford Co. still owns several vacant quarries with valuable water frontage, together with about 1800 acres of farm land. This firm will continue to do business.

During the summer of 1919 the Solvay Process Co. conducted extensive operations with diamond core drills, going to the depth of 150 ft. in the lime rock. These cores were shipped to Syracuse and a complete analysis made from each drilling. The tests proved highly satisfactory and approximately 1000 acres of the optioned properties were closed and the titles transferred, but no water frontage was obtained by the Solvay Process Co. in the deal nearer Chaumont than what was known as the Frank Adams farm, which borders on Chaumont river about a mile and a half upstream.

During the past year the Syracuse company recognized the necessity of acquiring the valuable water frontage held by the Adams and Duford Co on Chaumont river and negotiations have been going on for months past for a waterfront area of about 119 acres, running from and consisting of the old original Gaige quarries up and along Chaumont river toward Depauville. In fact the entire 1119 acres are all along that course and nearly adjacent in most places.



Oyster-shell lime kiln at the Haden Company's plant



Another view of 7x125-ft. rotary kiln of Haden Company

Wisconsin Politicians Baiting Cement Manufacturers

MILWAUKEE SOCIALISTS are trying to promote the appointment of a Wisconsin state legislature committee to investigate the possibility of a state portland cement plant.

H. Vanderwerp, vice-president of the Manitowoc Portland Cement Co., Manitowoc, Wis., told a committee of the house of representatives that Wisconsin limestone is not suitable for cement; that the state-owned cement plant in South Dakota has been a financial failure, that a similar plant in Michigan is "in the red" and that the establishment of such a plant in Wisconsin might be construed as another gesture hostile to industry.

Cement prices have been coming down, he said, and added that if there is any cement trust the Manitowoc company is not part of it. He also said that the Manitowoc company was not engaged in politics.—*Milwaukee* (Wis.) *Journal.*

Th. Avnsoe Made Vice-President of International Cement

THE BOARD OF DIRECTORS of the International Cement Corp., New York City, in meeting February 27 elected Th. Avnsoe to the office of vice-president in charge of operation and construction.

Mr. Avnsoe has been acting as assistant

Th. Avnsoe

to the president, and the action of the board was prompted by a desire to relieve E. Posselt, vice-president in charge of engineering, operation and construction, of some of his many duties. Mr. Posselt will devote his efforts to handling the company's development, engineering and purchasing.

Southern Minnesota Quarries Plan Extension

LINING UP with the unusually large number of plans for new construction and business projects in Faribault, Minn., during 1929 is the announcement that the most important quarrying development in recent years throughout southern Minnesota will be launched at the Lieb quarries, east of this city within a short time.

A $200,000 corporation, known as the Lieb Stone Co., has just been incorporated under the laws of Delaware with the right to do business in Minnesota, it was announced. John J. Lieb will continue as general manager of the new company.

The Lieb quarries have been worked for many years, but only recently have their enormous possibilities been discovered. Experts who have studied the rock formations have found that four types of stone are available at the local quarries. Much of the stone will be used for paving construction jobs where crushed rock is in great demand, some will be used as dimension stone for erecting buildings and still another type to be used will be the marble, found in large quantities at the local deposits. The fourth field of development is that of limestone to be used for agricultural purposes.

Up to the present time, Mr. Lieb has been handicapped because of a lack of sufficient working capital to handle the large paving contracts. The enormous demand for paving stone required by the Babcock plan of hard surface roads has made the business very profitable and now the company will be able to handle these contracts with newly added capital. The business has always been profitable, but as operations have been financed strictly out of earnings, it has not been able to keep pace with the greatly increased demand. The business has a very attractive future and as the supply of stone is unlimited, the present development will make the company a dominating factor in its field in this territory.

The present plans will require the employment of approximately 50 people for the greater part of the year with payroll of approximately $20,000 per year.

An announcement of the company said:

"Complete equipment will be installed at once to mine 10 to 20 carloads a day and the plant will be of the most modern in every way. Peak production will be maintained about seven months of the year. The expected total production of at least 1000 carloads per year at $100 per car average, will total $100,000 minimum sales. Only the number of paving contracts will limit its maximum. The freight advantage over outside competitors assures a virtual monopoly to the company in southern Minnesota."

Through the aid of a Minneapolis finance group, interested in the project by Steele and Larson, local brokers, the corporation was effected and the development launched. —*Fairbault* (Minn.) *News.*

Harry Brandon Joins Kentucky Rock Asphalt Staff

HARRY H. BRANDON, recently sales manager of the Ohio Marble Co., Piqua, Ohio, who has been prominent for many years in the National Crushed Stone

Harry H. Brandon

Association, having served as a director, and in the Ohio Crushed Stone Association, has joined the staff of the Kentucky Rock Asphalt Co., Louisville, Ky., as Ohio sales manager.

Central Sand and Gravel Co. Formed at St. Louis by New Merger

FOLLOWING the recent formation of the Standard Materials Co. at St. Louis another big merger of sand and gravel companies operating in the St. Louis territory has just been perfected with the consolidation of the Alpha Sand Co., the sand and gravel department of the Alpha Portland Cement Co. of Easton, Penn., the Gravois Material and Supply Co., the Meramec Portland Cement and Material Co. and the Ruprecht Sand and Material Co. The new concern is the Central Sand and Gravel Co. with an appraised valuation of $1,700,000. The new company will maintain its general offices at St. Louis and will operate a number of distribution yards in St. Louis, St. Louis county and East St. Louis, Ill. It will handle sand, gravel and all other kinds of building materials and supplies. Under its Missouri charter the company is also authorized to produce sand and gravel. George Ratermann, former president of the Meramec Portland Cement and Material Co., will be president of the new company. —*Chicago* (Ill.) *Journal of Commerce.*

Russell Frame

RUSSELL FRAME, in charge of accident prevention and personnel work for the Alpha Portland Cement Co., Easton, Penn., for several years, died of a heart attack at his home in Phillipsburg, N. J., March 8. Mr. Frame was well known

Russell Frame

throughout the portland cement industry for his earnest and whole-hearted, enthusiastic work for accident prevention. He was chairman of the cement-mill section of the National Safety Council and prominent in the activities of the committee on accident prevention and insurance of the Portland Cement Association. In his death the industry has not only lost an enthusiastic worker in the cause of safety, but one of its technical experts in practical ways and means to promote industrial safety.

Batesville White Lime Co. Building Crushing Plant for Ballast

THE Batesville White Lime Co., which operates large lime plants at Limedale, near Batesville, and at Ruddells, in Izard County, Arkansas, has signed a contract with the Missouri Pacific Railroad for 500,000 tons of crushed stone. The contract calls for delivery of 50,000 tons a year for 10 years. It is the largest contract for stone of this character ever let in this section of Arkansas. In order to fill this contract the lime company will have to install a $75,000 crushing plant. Work on this plant has started and will be finished within from 60 to 90 days. At this time the Batesville White Lime Co. is making 1500 bbl. of lime daily.—*Mountain Home* (Ark.) *Bulletin.*

Harry Lancaster

HARRY LANCASTER, partner with William McGrew in the ownership of the L. & M. Stone Co., Prospect, N. Y., died February 15, at his home in Utica. He had been connected with the crushed stone quarry industry in New York State for many years.

Indiana Still Agitating State Cement Plant

MEMBERS of the Indiana state senate have been making a careful study of provisions of a measure introduced by Senator Bruce Cooper setting up a "cement investigating committee and proposing a state-owned cement factory operated by prison labor."

The bill carries an appropriation of $70,000. The legislative committee would be chosen from the house and senate, three to be named by the governor, one by the lieutenant-governor, and one by the speaker of the house.

The committee would have unlimited power in swearing witnesses, issuing subpenas and administering oaths. It would be empowered, with the consent of the governor, "to secure and take and renew options on any materials suitable for the manufacture of cement and on any lands in or on which such materials may exist and on any land or lands available and suitable for the erection of a cement manufacturing plant and to pay out of the appropriations herein made, the cost of such options." All such options would be taken in the name of the state and would have to be so worded that they will expire not earlier than January 7, 1932, according to the bill.

The committee is not limited to the subject matter of the bill and is empowered to go outside the field of investigation in any manner it shall deem expedient.

The measure mentions the possibility of a special session of the legislature in that it requires that the committee report its findings and recommendations to the 1931 assembly, unless the governor shall deem it proper to have a special session to consider the appropriation of money to erect a cement plant or plants. The measure carried an emergency clause.—*Indianapolis* (Ind.) *News.*

Milton McDermott

MILTON McDERMOTT, president and principal owner of the Knoxville Sand and Lime Co., Knoxville, Tenn., died February 28 at St. Thomas Hospital at Nashville, Tenn. He had been ill several weeks. He was 46 years old.

Born in Rogersville, Tenn., Mr. McDermott was reared and educated in Chattanooga, where he attended the public schools and high school. Later he attended the Mt. Hermon preparatory school at Mt. Hermon, Mass., and he was graduated from the engineering department of the Drexel Institute, Philadelphia, Penn.

For several years he was connected with Brewer and Jones, construction engineers, at Birmingham, Ala. In 1914 he moved to Knoxville to take a position as general manager of the Knoxville Sand and Lime Co. In a few years Mr. McDermott became president and owner of the firm. He was treasurer of the National Lime Association at the time of his death, and had long been prominent in its councils.

Shortly after making his home in Knoxville Mr. McDermott was made a member of the Chamber of Commerce and he was active in all Knoxville civic welfare work. He was also a member of the Cherokee Country Club.

During the past few months Mr. McDermott had been in declined health. He closed his home in Melrose and was living at Whittle Springs before leaving for Nashville to be treated.

Funeral services were held at the home of Mr. McDermott's brother, Malcolm McDermott, dean of the University of Tennessee law college.

Mr. McDermott is survived by a widow, Mrs. Juanita Pierce McDermott; a daughter, Miss Muriel McDermott; his mother,

Milton McDermott

Mrs. Anne K. McDermott of Knoxville; his sisters, Mesdames W. S. Winn of Birmingham, Ala., A. J. Tyler of Bristol, and T. H. Johnston of Knoxville; his brothers, Malcolm McDermott, H. T. McDermott, Overbrook, Penn., and the Rev. Herbert McDermott, Donna, Texas.

Milton McDermott was of a quiet but earnest type. He was ever ready to give a helping hand in the affairs of the industry when its fortunes were at the lowest ebb. He was also active in the National Sand and Gravel Association and had served as a member of its board of directors.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

American Concrete Institute Papers Include Cement Products Discussion

Convention Held in Detroit Discusses Absorption, Specifications and Ready-Mixed Concrete

AT the Detroit convention of the American Concrete Institute there were quite a number of papers which were chiefly of interest to producers of concrete products. Abstracts of these papers are given here together with the discussions which followed the papers. The first session which dealt exclusively with concrete products and allied subjects was held on the afternoon of February 13 at the same time that a general design session was in progress. The latter was attended by a majority of the A. C. I. delegates, but the products session was also well attended. P. H. Bates, of the U. S. Bureau of Standards, was chairman of the products session, which included in its scope common cement units, cast stone, and stucco.

Cast Stone and Cement Products

The opening paper of this session was presented by ***John Tucker, Jr.,*** and ***C. W. Walker,*** of the U. S. Bureau of Standards, and was entitled "The Physical Properties of Pre-Cast Stone." The paper brings out the need for more testing on all kinds of cast stone and describes the tests carried on by the Bureau of Standards on various samples, together with tables showing the results obtained. The tests generally have not proceeded far enough to establish definite relations for the most part. The authors make one suggestion in discussing strength tests, by questioning whether transverse strengths or compressive strengths should be used. They say they have used both, and as yet have not found a relation between the two.

The second paper of this discussion was presented by ***Fred Weigel,*** of the Southern Concrete Products Co. of Knoxville, Tenn., and is entitled "Testing Concrete for Absorption." The tests are described and some of the factors affecting the absorption are suggested. The author concludes that the permeability test should be changed, as it is only of value when testing concretes having the same ratio of cement to aggregate, and is certainly unfair when used as a basis for comparing concrete products with natural materials, such as stone. The paper describes the apparatus used for testing for permeability by the writer.

Absorption in Cement Products

Continuing the subject of absorption, ***Raymond Wilson,*** associate chemist in the research laboratory of the Portland Cement Association gave a paper on "The Limitations of the Absorption Test for Concrete Products." Mr. Wilson is of the same opinion as the previous speaker in regard to the absorption test, and concludes that:

"It has been shown that as a criterion of the quality of concrete products the absorption test as now made is of little value because neither of the assumptions on which it is based is applicable to concrete. First, it does not truly indicate the porosity of the concrete as that porosity is likely to develop in service, because of the more severe drying imposed in the standard tests. Second, the porosity of the *dried* concrete which it does indicate is given in terms of the whole volume of concrete, whereas it is the porosity of the cement paste which is chiefly related to the useful properties of concrete. It is the size and extent of the pores under normal conditions rather than under the artificial conditions of extreme drying which determine the susceptibility to attack by the agencies of weathering. The size and extent of the pores are a function of the composition of the paste and its curing conditions.

"A possible form of specification based on *rate of absorption* is suggested as likely to indicate more directly the quality of concrete products, especially if coupled with a strength requirement. The manufacture of a product which would comply with a specification of this type would require proper proportioning of the mix and adequate curing of the product.

"The temperature at which concrete is dried prior to the absorption test, as now made, affects the results but the effect is of little moment if the limitations of the test in other ways are considered.

"The advantage of the slightly lower absorption values obtained when the concrete is completely dried at temperatures below that of boiling water does not compensate for the added length of time required for drying and the likelihood of incomplete drying under those conditions. Drying at the lower temperature for a fixed period of 24 hr. is likely to lead to results difficult of duplication because of the incompleteness of drying of even small specimens in that length of time."

C. G. Walker, of the Portland Cement Association, and secretary of Committee P-3, on Concrete Stone, presented the report of that committee in the form of "Proposed Specifications for Cast Stone." The portions of the proposed specification which received the most attention dealt with the proposed required compressive strength of cast stone, and with absorption. The figure for the former was set at 5000 lb. per sq. in. when tested in 2x2-in. cubes or cylinders, while for the latter it was proposed that the average absorption should be not less than 3% and not more than 7% of water by dry weight of the specimen, when tested in 2x2-in. cylinders or cubes.

The committee report concludes:

"In proposing that the minimum compressive strength of cast stone at an age of 28 days or less be 5,000 lb. per sq. in., the committee realizes that upon first consideration the requirement may seem somewhat high.

"However, it must be pointed out that the compression test is made on a comparatively small specimen which is completely dry—

two conditions tending to produce higher strengths in concrete. Moreover, tests have definitely shown that 5000 lb. per sq. in. is a fair value for the compressive strength of cast stone.

"The abiilty of cast stone to remain clean and free from discoloration is one of its greatest advantages. It is important that such an advantage be maintained and improved and to that end the committee has adopted absorption as a measure of this desirable property. The committee is aware of the questions that have been raised as to the correctness of the absorption requirements and present methods of making the absorption test. However, it is firmly convinced that at this time no more reliable measure or procedure is available."

In the discussion which followed, ***P. H. Bates,*** of the Bureau of Standards, who presided at the meeting, said that each specification for precast stone has included a method of testing for absorption, and in each case it has been different. He pointed out that what really should be measured is the durability and that the absorption test is only useful to show its relation to durability. The tester is not particularly interested in the porosity, he pointed out, so if the durability is O. K., why worry about the absorption. Several other producers questioned the advisibility of the absorption test specification until more definite information was obtained on it. A number also favored a lower compressive strength value, the opinion being that since stone is not used to any great extent to carry heavy loads the high strength was unnecessary. However, it was admitted that the high strength was an indication of a good unit and because of this was worth while. The specifications were passed by the session, and are to be passed by the general A. C. I. for adoption.

Concrete Stucco

W. D. M. Allan, manager of the cement products bureau of the Portland Cement Association presented the report of Sub-Committee 1 on stucco, of Committee C-3 on Treatment of Concrete Surfaces. His report included the submitting of "Proposed Specifications for Finish Coat Portland Cement Stucco." The important specifications include a requirement for a minimum compressive strength of 2000 lb. per sq. in., and an absorption of not more than 10% of water. Also finish coat stucco shall not contain more than 35% of the whole sample of material passing the 100-mesh sieve.

O. A. O'Neil suggested in the discussion which followed the paper that a percolation test would more nearly suit the actual conditions for cast stone and stucco than would a straight absorption test. Mr. Allan agreed that possibly this was correct, but pointed out the absorption test, in some kinds of cement products at least, is a very good criterion for regulating the quality. Arguing against the suggestion made by some of the members that the absorption test be dropped entirely, he said that rather than dropping it a middle course should be taken. In other words, it might well be omitted in some specifications but for other products where the results can be correctly interpreted the absorption test should be kept.

In discussing the proposed specifications Mr. Allan said that all stuccos are forced to accept the trouble made by certain particular kinds which are not up to standard. He said that portland cement stucco could be made up to an acceptable standard. He pointed out that a portland cement stucco should have the properties of a portland cement mortar, including workability. After the discussion by Mr. Allan and others the proposed specifications were passed by the session as read.

Curing Concrete Products

R. A. Foley, general manager of the Superior Products Co. of Detroit, spoke on "The Effect of Curing Temperatures." He named the five important points to be remembered in securing a good concrete product as being (1) proper balance of the aggregate, (2) proper quality aggregate, (3) correct water-cement ratio, (4) right mixing, and (5) proper curing. He pointed out that any one of these could spoil the product and watching all five elements was necessary. He also stressed the fact that every products plant should have access to a testing laboratory for testing its products from time to time. This was to insure a good quality since the three main points in selling products were quality, service and correct price.

Mr. Foley detailed some of the tests at his plant and explained the results. He concluded from the tests that either extreme of temperature was dangerous for curing and that in a wet atmosphere the effect was more pronounced. He also noted that concrete pipe was more subject to changes in temperature than was ordinary block. Pipe reduced 25% in strength due to temperature shock when removed from inside and placed in a freezing atmosphere, and the product did not return to its 3-day strength when taken from the freezing temperature.

The paper states that uniform temperature curing is important, and also that humid and rainy seasons are the best for curing. At high temperatures the product will not attain its highest strength and hence such temperatures are dangerous. It was found that 110 deg. F. is about the best temperature for curing and that above that point the strength reduces. The maximum temperature at which a good product can be obtained is approximately 120 deg. F.

Mr. Foley concluded by stating that there is nothing in the specifications for concrete products concerning curing and he recommended that some specification on this be included. Mr. Bates pointed out that it is the policy of the Institute to include in its specification certain requirements as to the finished product, but to leave the means of meeting these requirements up to the original producer. For this reason, he said, no curing specification had been included.

Time of Mix Discussed

The Committee on Concrete Products Plant Operation (P-6) reported on "The Effect of Time of Mix on Non-Plastic Concrete." It was pointed out that frequently the length of the mixing time was not nearly as important as other factors. However, it was determined that little was to be gained by mixing longer than 5 or possibly 7 minutes after the water is added, and the committee felt that mixing for this length of time was the most economical for cement products plants. The strength rises greatly for the first 1 to 2 minutes and from there rises more gradually up to 5 to 7 minutes. The tests for the work of this committee were carried on at Detroit and Arlington Heights, Ill.

At this session, reports were also submitted for the proposed revision of the "Specifications for Concrete Brick" and for the proposed "Specifications for Reinforced Concrete Culvert Pipe." For the latter specifications, uniform loads of 2000 lb. per sq. ft. and 4000 lb. per sq. ft. for standard reinforced concrete culvert pipe and extra strength reinforced concrete culvert pipe respectively were named.

Development of Specifications for Concrete

In the evening session on February 13, presided over by ***A. E. Lindau,*** the discussion centered about the development of specification for all phases of concreting operations. A paper of particular interest at the present time was given by ***P. J. Freeman,*** chief engineer, of the Department of Public Works of Allegheny County, Pennsylvania. Mr. Freeman spoke on "Some Considerations for Specifications for Centrally Mixed Concrete," and pointed out that the rapid development of this form of concrete has necessitated revisions in the specifications. He pointed out that the problem of hauling was at present receiving the most attention, and gave some of the conclusions that had been reached in the Pittsburgh district in this regard. First was that if the concrete is not segregated when it reaches its point of delivery it is all right, providing of course it has not set. As to the latter, he said that he had found that concrete could be transferred as much as 25 miles, and be in transit up to three hours, and still be all right upon delivery, if it is in a workable condition at that time, and does not need additional water.

Mr. Freeman stated that concrete from ready-mixing plants may be better than concrete mixed on the job due to the better machinery available and the more accuracy possible. However, if the job needs a lot of concrete to keep the work going continuously and if the trucks do not get there fast enough, it is necessary to have a supplementary mixer installed on the job. This is the practice in the Pittsburgh district, Mr.

Freeman said, and there the ready-mixed plant and the contractor reach a definite agreement on this point before the work is started.

In considering the advisability of using centrally-mixed concrete, the following factors are considered: (1) The available mixing plants, and their capacities, service and quality, (2) whether the selected mixing plant will permit a variation from their standard mix to suit job requirements, (3) the mixing time allowed at the plant, (4) the time limit to the job, (5) unit prices for admixture, if any are used, (6) type of truck, (7) does the company provide for testing, (8) what provision is made for rejection of loads because of delay or because of bad condition due to segregation, etc. In buying ready-mixed concrete it is recommended that the product be purchased by weight.

In the discussion which followed Mr. Freeman's paper it was brought out that the strength was actually more for ready-mixed concrete than for concrete made on the job. One explanation of this was that the labor on the job was unskilled and irresponsible, and that at the plant it was of a high grade. The labor turnover on the job is very high it was pointed out. Another advantage of the central plant was the possibility afforded for ready testing at all times.

In the discussion of transporting the mix it was claimed that the present style of truck bodies are much better than the old style, and particularly so because they will keep the water in and thus prevent a change in consistency. Agitation during transit will help to maintain workability, it was stated.

Two other points were brought out. The first was that the fines in the concrete should be increased, within reason, for good mixes. The other point related to service and suggested that all central mixing plants ought to have a contact man, or trouble man out all of the time visiting the various jobs to see that everything is going along alright and the contractors are using the concrete correctly.

T. A. Hart suggested that centrally mixed concrete is bound to come, and that the Institute should be prepared for it by adopting the specifications recommended by Mr. Freeman. Mr. Hart suggested a special Institute committee to consider these.

H. F. Thomson, St. Louis, suggested the possibility of confusion between the terms "ready-mixed" and "centrally-mixed" concrete. He said that ready-mixed should be applied to both truck mixed concrete and concrete mixed at a plant, but that the term "centrally-mixed" could only be applied to concrete mixed at a central plant. He said that both types have their advantages and both will be important in the future so that it is very desirable to have the names correct so that there will be no confusion.

Concrete Masonry Units

E. Grant Lantz, of the Cement Products Bureau of the Portland Cement Association, delivered a paper on "Standard of Performance of Concrete Masonry Units." The paper discusses the requirements placed upon masonry units, which can be roughly divided into two heads — support and protection. Under the latter heading comes temperature insulation, fire resistance, resistance to weathering, sound insulation and similar factors. Mr. Lantz referred to the new light-weight types of units which are being developed particularly for skyscraper construction. He defined wall efficiency as a relationship between the strength of the masonry and the strength of the component parts. This, of course, is largely dependent on the character of the bond between the units. The other factor given particular notice is permanence, which has been tested by alternate freezing and thawing tests

Mr. Lantz concludes that the data emphasizes the properties other than strength—that is temperature insulation, permanence, fire resistance, weight, wall efficiency and bond, and sound insulation—but that undoubtedly strength is equally as important.

Concrete for Stucco

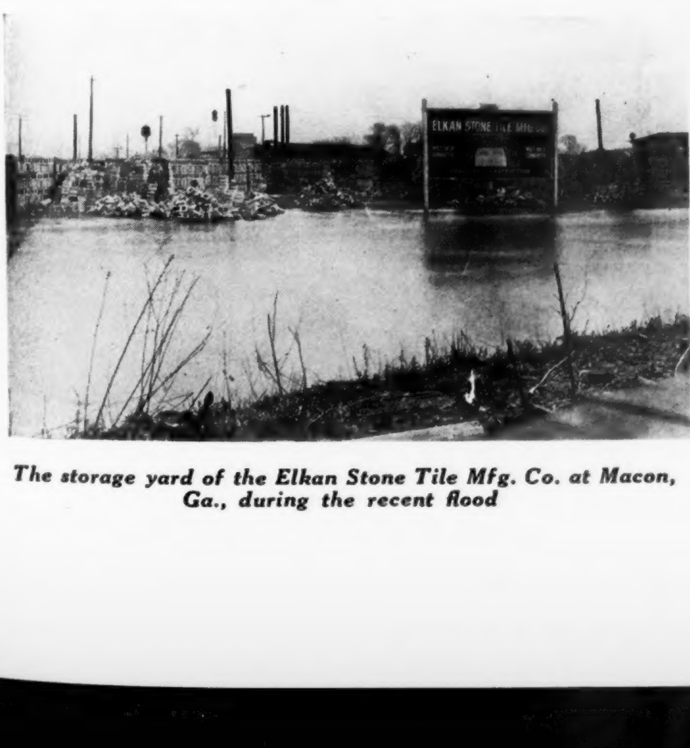
W. D. M. Allan, manager of the cement products bureau of The Portland Cement Association, presented a paper on "Standards of Performance of Concrete for Stucco." He lists as the requirements of portland cement stucco the following: Durability, workability, watertightness, resistance to frost action, freedom from discoloration, freedom from crazing, windproofness, fire resistance, and ability to protect reinforcing metal. These requirements are discussed at length and the report includes a review of tests carried out in the study of each.

In the discussion which followed the paper, ***J. C. Pearson,*** of the Lehigh Portland Cement Co., called attention to the fact that 2000 lb. per sq. in. is required of stucco and yet it actually has little compression to bear in use. In this case the strength is taken as a measure of the durability which is one of the important factors. Similarly, he said that absorption, as such, had little to do with the value of stucco on the wall, but if it can be shown to be a measure of the durability, it is important. Shrinkage, he said, was really the worst enemy of stucco.

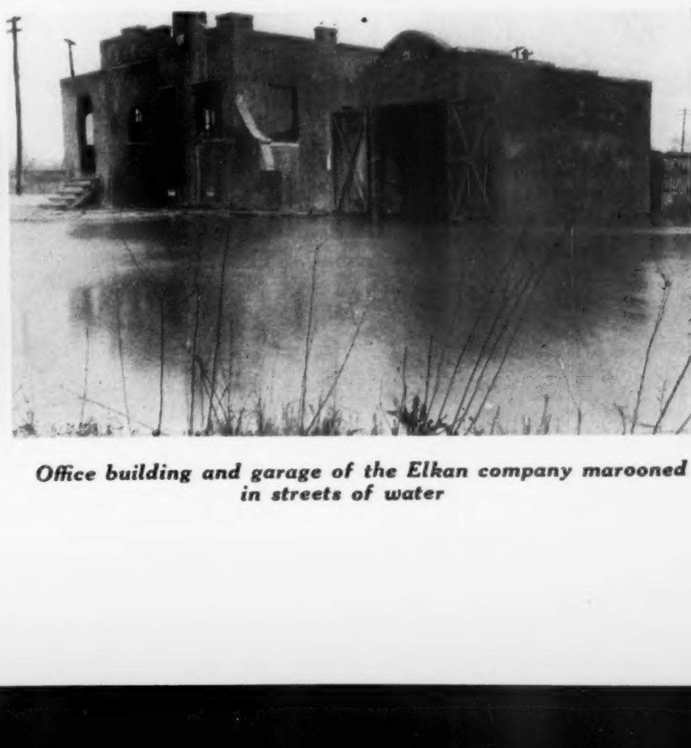
Frank Spayth, of the Finishing Lime Association, Toledo, Ohio, said that to cut down shrinkage, a better grading of the aggregate would help. Referring to admixtures in stuccos he pointed out that up to the present time only the quantity of lime to be added had been considered in the specifications, which now call for about 10% of lime. He said that there is such a wide difference in the quality of lime that it was important that specifications also provide for the quality of lime as well as for the quantity.

Rock Products Industries in the Southern Floods

SPRING may mean flowers for some people, but for many portions of the country it means floods instead. Rock products industries have been hit pretty hard in the last month or so, particularly in the southern part of the country. One typical example is shown in the accompanying illustrations of the Elkan Stone Tile Mfg. Co. plant at Macon, Ga., where production was kept up under watery difficulties. The great expanse of water in the foreground of the pictures is not a river, but merely a well-traveled Macon street.



The storage yard of the Elkan Stone Tile Mfg. Co. at Macon, Ga., during the recent flood



Office building and garage of the Elkan company marooned in streets of water

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	...	1.30	1.10	1.00	1.00	...
Frederick, Mo.	.50- .75	1.35-1.45	1.15-1.25	1.10-1.20	1.05-1.15	1.05-1.10
Ft. Springs, W. Va.	.40	1.25	1.25	1.25	1.15	1.15
Munns, N. Y.	1.00	1.25	1.25	1.15	1.00	...
Prospect, N. Y.	.80	1.15	1.15	1.15	1.15	...
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.65	1.35	1.25	1.00	.95	.90
Syracuse, N. Y.	.50	...	1.00	1.00	1.00	1.00
Walford, Penn.	...	...	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
West Chester, Penn.	5.00g	...	...	...	...	4.00k
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	...	...	...	...	.50	1.50
Alton, Ill.	1.85	...	1.85	...	...	...
Columbia and Krause, Ill.	1.05-1.40	.95-1.50	1.15-1.50	1.05-1.50	1.05-1.50	...
Cypress, Ill.	.90-1.15	.90-1.15	1.00-1.15	1.00-1.20	1.00-1.15	1.00
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.95	1.10	...	1.10	1.10	...
Stolle and Falling Springs, Ill.	1.05-1.40	.95-1.50	1.15-1.50	1.05-1.50	1.05-1.50	...
Greencastle, Ind.	1.25	1.10	1.10	1.10	1.10	1.00
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	...	.90-1.00	1.00-1.10	.90-1.00	.85- .90	.85- .90
Northern Ohio points	.85-1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	...	1.20	1.05	1.00	...
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.10	1.70	1.70	1.70	1.70	1.70
Toronto, Canada	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90-1.20	...	...	1.75	...	1.75
Waukesha, Wis.	...	.90	.90	.90	.90	...
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	...	1.00	.90	.90	...
Youngstown, Ohio	.70j	1.25l-1.35h	1.25l-1.35h	1.25l-1.35h	1.25l-1.35h	1.25l-1.35h
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	...
Chico and Bridgeport, Tex.	.50-1.00	1.10-1.30	1.20-1.30	1.10-1.20	1.00-1.10	.95-1.10
Cutler, Fla.	.60r	...	...	1.75r	1.10r	...
El Paso, Tex.	.50-1.25r	1.00-1.50	1.00-1.75	1.00-1.75	1.00-1.75	...
Graystone, Ala.	Crusher run, screened, $1 per ton					
Olive Hill, Ky.	1.00	1.00	1.00	1.00	.90	.90
Rocky Point, Va.	.50- .75	1.40-1.60	1.30-1.40	1.15-1.25	1.10-1.20	1.00-1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	...
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	...	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	...
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.60	1.35	1.25	1.25-2.00
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	...
Northern New Jersey	1.40-1.45	1.40-2.20	1.60-2.00	1.40-1.60	1.40-1.60	...
Richmond, Calif.	.75	...	1.00	1.00	1.00	...
Spring Valley, Calif.	.90-1.25	.90-1.25	.90-1.25	.90-1.25	.90-1.25	.90-1.25
Springfield, N. J.	1.40	2.00	1.90	1.60	1.60	...
Toronto, Canada	...	5.80	4.05	4.05	...	...
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	...

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	...
Cayce, S. C.—Granite	.50	...	1.75	1.75	1.60	...
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00	...	2.35	...	...	...
Lithonia, Ga.—Granite	.75a	1.75b	1.75	1.35	1.25	...
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	...
Middlebrook, Mo.	3.00-3.50	...	2.00-2.25	2.00-2.25	...	1.25-3.00
Richmond, Calif.—Quartzite	.75	...	1.00	1.00	1.00	...
Somerset, Penn. (sand-rock)	1.50 to 1.85					
Toccoa, Ga.—Granite	...	1.40	1.40	1.35	1.25	1.25

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.50. (g) Run of quarry. (h) Less 10c discount. (j) Less 10% net ton. (k) Rubble stone. (l) Less .05. (n) Ballast R. R., .90; run of crusher, 1.00. (p) Carloads prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yard.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$	7.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—Analysis, 94.89% $CaCO_3$; 1.5% $MgCO_3$; 50% thru 100 mesh	3.50-5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.—50% thru 50 mesh	2.00
Pulverized, per ton	2.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill. — Analysis, 95% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.05; 90% thru 4 mesh, 1.10; 50% thru 4 mesh	1.00
Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk	3.50
Paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25 cash 15 days)	
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton	6.00
90% thru 20 mesh, bulk, per ton	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk	2.70
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	1.75
Marl — Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	2.25
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.00-4.50
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35-1.60
Olive Hill, Ky.—Analysis, $CaCO_3$ 94-98%; 50% & 90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 101.12%; 99% thru 10, 60% thru 50; 45% thru 100	2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk	3.50
100% thru 4, 30% thru 100, bulk	1.50
Rocky Point, Va. — Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Watertown, N. Y. — Analysis, 53.72% $CaCO_3$; pulverized; sacks, 4.25; bulk	2.75

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%. $MgCO_3$; 90% thru 10 mesh	1.50
30% thru 100 mesh	1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $McCO_3$; 90% thru 4 mesh	1.00–1.25
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton	1.25
90% thru 4 mesh, per ton	1.10
Dubuque, Iowa—Analysis, 54% $CaCO_3$; 38% $MgCO_3$; crusher run rescreened	.85
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Spring, W. Va. — Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.50
Kansas City, Mo.—50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind. —85% thru 10 mesh, 25% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags	5.00
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh	1.10–1.70
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.10
Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.10–1.70

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks	6.00
Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra)	3.50
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50-5.00; bulk	3.00–3.50
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk	2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J.	*1.75–2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Klondike, Mo.	2.00
Massillon, Ohio	3.00
Michigan City, Ind.	.30– .35
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
Rockwood, Mich.	2.25–3.00
San Francisco, Calif.	4.00–5.00
Silica and Mendota, Va.	2.00–2.50
St. Louis, Mo.	2.00
Utica and Ottawa, Ill.	.75–1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.30	
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.		1.75
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.		1.75

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.50	.50	1.15	1.40	1.40	
Attica and Franklinville, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00
Boston, Mass.†	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.60	.85			1.25	
Leeds Junction, Me.		.50	1.75		1.25	1.00
Machias Jct., N. Y.	1.00	1.00	1.00		1.00	1.00
Milton, N. H.		.50				.90
Montoursville, Penn.	1.00	.80	.60	.60	.50	.50
Northern New Jersey	.50– .60	.50– .60		1.25	1.25	
Somerset, Penn.		2.00				
South Portland, Me.		1.25	2.50			2.25
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*		.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75		1.75
Washington, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.50	.35	.25	.45	.45	.50
Attica, Ind.			All sizes .75–.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.50	.35	.20	.50	.60	.60
Barton, Wis.		.40s		.65s	.65s	.65s
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90r
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio		.60	.50	.60	.60	
Des Moines, Iowa		.60	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.		.55	.70	1.00	1.00	
Elkhart Lake, Wis.	.40	.40	.60	.60	.60	.50
Ferrysburg, Mich.		.50– .80	.60–1.00	.60–1.00		.50–1.25
Grand Haven, Mich.		.60		.90		.90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		1.00	1.00		1.00	
Hersey, Mich.		.50				.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60		.90	.75–1.00	.75–1.00
Mankato, Minn.	.55	.45	.60		1.25h	
Mason City, Iowa	.50	.50	.80	1.25	1.25	1.25
Mattoon, Ill.			.75–.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn. (g)	.35	.35	1.35	1.35	1.35	1.25
St. Louis, Mo. (b)	1.30e	1.30f	1.55t	1.55	1.55	1.65
St. Louis, Mo.†	2.00e	2.00f	2.25t	2.25	2.25	2.35
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.		.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.40– .50					
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.		River sand and gravel, all sizes, 1.40				
Eustis, Fla.		.45– .50				
Ft. Worth, Texas	1.00	1.00	1.10	1.10	1.10	1.10
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.00
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.30	.30	1.00	.80	.80	.80
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Oregon City, Ore.		All grades range from 1.00 to 1.25 per cu. yd.				
Otay, Calif.		.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.80	.60		1.25		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			.40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.35
Burnside, Conn.		.75*				
Chicago, Ill.	1.25m			.35		
Des Moines, Iowa		.75				
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Falls, Wis.					.65	
Fort Worth, Texas						.60r
Gainesville, Tex.					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio					1.00	
Hersey, Mich.				.50		
Indianapolis, Ind.		Mixed gravel for concrete work, at .65				
Macon, Ga.	.35					
Mankato, Minn.	.70					
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Roseland, La.				.60	.60	.60
Somerset, Penn.		1.85–2.00		1.50–1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.		Mine run gravel, 1.55 per ton				
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.						.60
York, Penn.	1.10	1.00				

*Cubic yd. †Delivered on job by truck. (a) ⅝-in. down. (b) 1½- to ¼-in., 1.65. (c) 2½-in. and less. ‖By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Per yd., del. by truck, ¼-in. down, 1.25; 2 in. and less, 2.40. (h) ¾-in. and larger. (j) Lake sand, 1.75, delivered. (k) 60–70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu. yd., f.o.b. cars, Chicago. (r) Pit run. (s) Plus 15c for winter loading. (t) Fine and regular binder. (u) Coarse, torpedo, also roofing. (v) Coarse binder. †2% discount if paid by 15th of month following delivery.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.75	2.75				
Beach City, Ohio	1.75	1.75		1.50	1.50		
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00–1.25			
Eau Claire, Wis.						2.50–3.00	
Elco and Murphysboro, Ill.	Water-floated ground silica per ton in carloads—18.00–31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35–1.50	
Franklin, Penn.	1.75–2.25	1.50–1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10–1.50	1.25–2.00	2.00			2.75–3.00	
Klondike, Mo.	2.00			2.00			
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30– .35			
Montoursville, Penn.				1.35–1.50			
New Lexington, Ohio	2.00	1.75					
Ohlton, Ohio	1.75	1.75		2.00	1.75	1.75	
Ottawa, Ill.	1.25	2.25	2.25	2.25	1.25	3.50	2.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	
Silica, Mendota, Va.	Potters sand, 8.00–10.00g						1.75
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h		1.50*–2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Also 12.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.00		1.25			
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio		1.30*		1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	1.45*
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	1.45*
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅝ in. to 10 mesh, $1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50–9.50[7]	8.50–9.50[7]	8.50–10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.						10.00	7.50	
Carey, Ohio	11.50	7.50	7.50		8.00		7.50	1.50
Cold Springs, Ohio		7.50	7.50					
Gibsonburg, Ohio	11.50				8.00	10.00		
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Luckey, Ohio	11.50							
Milltown, Ind.		8.50–10.00		10.00[8]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00[23]	7.50	1.50[16]
Scioto, Ohio	11.50	7.50	7.50	8.50	8.00	1.25	7.00	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	8.00	1.50[3]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00–9.50	8.00–9.50			9.50[15]	7.00[15]	
Graystone & Landmark, Ala.	12.50	9.00		12.50			7.50	1.35
Keystone, Ala.		9.00	8.00	9.00	9.00	11.00	7.50	1.35
Knoxville, Tenn.	19.00	9.00	9.00	9.00			7.50	1.35
Ocala, Fla.		11.50	10.50	12.00				1.50[10]
WESTERN:								
Kirtland, N. M.							15.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.50	17.50	12.70	17.50–19.00	13.00[19]	.90[17]	13.00[19]	1.85[17]
Tehachapi, Calif.[18]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] In bags. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] to 1.70. [17] Less credit for return of empties. [18] 90-lb. sacks. [19] Also 14.50. [22] To 9.00. [23] Per bbl., 2.15. [30] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Ground talc (20-50 mesh), bags	5.75– 8.50
Ground talc (150-200 mesh), bags	7.00–15.00
Pencils and steel crayons, gross	.75– 2.50
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	7.00– 8.00
Same, including 50-lb. bags	8.00– 9.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Conowingo, Md.:	
Crude talc, bulk	4.00
Ground talc (150-200 mesh), in bags	14.00
Cubes, blanks, per lb.	.10
Dalton, Ga.:	
Crude talc (for grinding)	4.00
Ground talc (150-200 mesh), bags	9.00
Pencils and steel worker's crayons, per gross	1.00– 2.00
Emeryville, N. Y.:	
(Double air floated) including bags: 325–350 mesh	14.75–16.00
Hailesboro, N. Y.:	
Ground talc (300-350 mesh) in 200-lb. bags	15.50–20.00
Henry, Va.:	
Crude (mine run)	3.50– 4.50
Ground talc (150-200 mesh), bags	8.75–14.00
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California white	30.00
Southern white	20.00
Illinois talc	10.00
Crude talc	3.75
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00–30.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50– 4.50
Gordonsburg, Tenn.—B.P.L. 68-72%	4.00– 4.50
Mt. Pleasant, Tenn.—B.P.L., 77%	6.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00– 9.00

Ground Rock

(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 68%	3.50
B.P.L. 72%	4.50
Mt. Pleasant, Tenn.—Lime phosphate:	
B.P.L., 72.50%, 80% thru 300 mesh	11.70
B.P.L. 72%	5.00–5.50
Twomey, Tenn.—B.P.L. 65%	8.00
Wales, Tenn.—B.P.L. 65%	11.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

New York City, N. Y.—Per lb.,	
Cut mica (1½x2)	1.60
Cut mica (8x10)	26.00
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50–24.00
Roofing mica	37.50
Punch mica, per lb.	.12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, and American Botticino, coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica spar	....	b9.00–‖12.00
Davenport, Ia.—White limestone, in bags	6.00	6.00
Easton, Penn.—Royal green	16.00–18.00a	....
Harrisonburg, Va. — Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash	....	11.00–18.00
Middlebrook, Mo.—Red	....	20.00–25.00
Middlebury, Vt. — Middlebury white	....	†9.00–‖10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	....	5.50– 7.50
Phillipsburg, N. J.—Royal green granite	....	16.00–20.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits	....	12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	....
Warren, N. H.	....	¶7.90–‖8.95
Wauwatosa, Wis.	....	20.00–32.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.	....	*10.00

†C.L.; L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. (b) In 100-lb. bags, car lots, min. car 20 tons. * Per 100 lb.

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh	19.00
Buckingham, Ore. — White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y. — Color, white; analysis, K_2O, 9.63%; Na_2O, 1.01%; SiO_2, 69.72%; Fe_2O_3, .00%; Al_2O_3, 18.6% (crude); bulk, per ton	9.00
East Hartford, Conn. — Color, white, 40 mesh to 200 mesh	15.00–28.00
East Liverpool, Ohio — Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk	11.00–12.50
Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk	15.75–22.50
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk (Bags 15c extra.)	18.00
Crude feldspar, bulk	10.00
Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Colo, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50– 8.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Texas	10.00–12.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks:	
Feldspar	14.00
Gypsum	7.50– 9.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	7.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags. (a) F.o.b. Middlebury, Vt.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	11.00
Anaheim, Calif.	10.50–11.00
Barton, Wis.	10.50g
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50–13.50
Detroit, Mich. (h)	j13.00–16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00–19.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Lancaster, N. Y.	12.50
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.50–15.00*
Pontiac, Mich.	11.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.00–14.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
South St. Paul, Minn.	10.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	15.00†e
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc. 10 days. ‖Dealers' price. (a) Less 50c disc. per M, 10th of month. (d) 5% disc., 10th of month. (e) Delivered. (f) F.o.b. yard, 12.50. (g) Delivered Milwaukee, 13.00. (h) Also 15.50. (j) Also 14.00.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.	....	2.36	3.51¶
Baltimore, Md.	....	2.25–2.65	3.55¶
Birmingham, Ala.	....	2.00	3.44¶
Boston, Mass. (g)	.68¼	2.23–2.73e	3.27¶
Buffalo, N. Y. (h)	.62½	2.00–2.50	3.40¶
Butte, Mont.	.90¼	3.61	......
Cedar Rapids, Iowa	....	2.24	......
Charleston, S. C.	....	2.25–2.65d	3.58¶
Cheyenne, Wyo.	.64	2.56	......
Chicago, Ill.	....	2.05–2.45	3.35¶
Cincinnati, Ohio	....	2.22–2.62	3.52¶
Cleveland, Ohio	....	2.24–2.64	3.54¶
Columbus, Ohio	....	2.22–2.62	3.52¶
Dallas, Texas	....	1.80	3.39¶
Davenport, Iowa	....	2.24	......
Dayton, Ohio	....	2.22–2.64	3.54¶
Denver, Colo.	.63¾	2.55	......
Des Moines, Iowa	....	2.14	......
Detroit, Mich.	....	1.95–2.35	3.25¶
Duluth, Minn.	....	2.04	......
Houston, Texas	....	1.90	3.63¶
Indianapolis, Ind.	.54¼	2.09–2.49	3.39¶
Jackson, Miss.	....	2.04–2.44	3.54¶
Jacksonville, Fla.	....	2.60b	3.79¶
Jersey City, N. J.	....	2.13–2.53	3.43¶
Kansas City, Mo.	.45½	1.82	3.22¶
Los Angeles, Calif.	.62½	2.50	......
Louisville, Ky.	.55½	2.57	3.47¶
Memphis, Tenn.	....	2.04–2.44	3.34¶
Milwaukee, Wis.	....	2.20–2.60	3.50¶
Minneapolis, Minn.	....	2.12–2.22	......
Montreal, Que.	....	1.60	......
New Orleans, La.	.45½	1.82	3.61¶
New York, N. Y.	.60¾	1.93–2.43	3.33¶
Norfolk, Va.	....	1.97	3.27¶
Oklahoma City, Okla.	.57¼	2.29	3.69¶
Omaha, Neb.	.54	2.16	3.56¶
Peoria, Ill.	....	2.22	......
Philadelphia, Penn.	....	2.05–2.15	3.51¶
Phoenix, Ariz.	....	3.91*	......
Pittsburgh, Penn.	....	2.05–2.44	3.34¶
Portland, Ore.‡	....	2.40–2.90a	......
Reno, Nev.‡	....	2.91–3.41a	......
Richmond, Va.	....	2.32–2.72	3.62¶
Salt Lake City, Utah	.70¼	2.81	......
San Francisco, Calif.‡	....	2.21–2.71a	......
Savannah, Ga.	....	2.60c	3.65¶
St. Louis, Mo.	.48¾	1.95–2.35	f3.25¶
St. Paul, Minn.	....	2.12–2.22	......
Seattle, Wash.	....	2.50–2.65j	f3.50†
Tampa, Fla.	....	2.40	4.11¶
Toledo, Ohio	....	2.20–2.60	3.50¶
Topeka, Kans.	.50¼	2.01	3.41¶
Tulsa, Okla.	.53¼	2.13	3.53¶
Wheeling, W. Va.	....	2.12–2.52	......
Winston-Salem, N. C.	....	2.29–2.69	3.59¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Albany, N. Y.	.43¾	1.75	......
Bellingham, Wash.	....	2.10	......
Buffington, Ind.	....	1.80	......
Chattanooga, Tenn.	....	2.45*	......
Concrete, Wash.	....	2.35	......
Davenport, Calif.	....	2.05	......
Hannibal, Mo.	....	1.90	......
Hudson, N. Y.	....	1.75	......
Leeds, Ala.	....	1.65	......
Lime and Oswego, Ore.	....	2.50‡	......
Mildred, Kan.	....	2.35	......
Nazareth, Penn.	....	2.15	......
Northampton, Penn.	....	1.75	......
Richard City, Tenn.	....	2.05	......
Steelton, Minn.	....	1.85	......
Toledo, Ohio	....	2.20	......
Universal, Penn.	....	1.80	......

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (a) Includes cloth sacks returnable at 10c each. (b) 24c bbl. refund for paid freight bill. (c) 35c bbl. refund for paid freight bill. (d) 40c bbl. refund for paid freight bill. (e) 45c bbl. foreign refund. (f) "Velo" cement, including cost of paper bag. ¶ "Incor" Perfected prices per bbl. packed in paper sacks. (g) Also 2.33 per bbl. (h) Also 2.10 per bbl. (j) 25c bbl. disc. 10 days.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	Plaster Board ¼x32x 36". Per M Sq. Ft.	Plaster Board ⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.70	4.00	4.00	4.00	4.00	4.50	....	....	....	....	....	15.00	20.00
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	....	....	....	....	11.70u	....	....	....
Blue Rapids, Kan.	1.70	4.00	....	....	....	....	10.00	....	....	....	....	15.00	20.00
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	....	....	13.50	....	....	....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	....	....	....	....	14.30o	12.30m	....	m9.00–11.00o	....	....	....	....	....
Delawanna, N. J.	....	....	....	4.50–5.00	13.10–14.00	5.00	....	7.25	....	....	....	....	25.00
Douglas, Ariz.	....	....	6.00	14.50	15.00	....	18.00	....	30.00	....	....	....	....
Fort Dodge, Iowa	1.70	4.00	6.00	9.00	9.00	9.50	....	....	....	19.00	....	15.00	20.00
Grand Rapids, Mich.	2.65	4.00	6.00	6.00	9.00	9.00	17.65	....	22.75	19.00	12.00	15.00	18.00
Gypsum, Ohio	1.70–3.00	4.00	6.00	7.00–9.00	9.00	9.00	19.00	7.00	24.50	19.00	....	15.00	20.00–25.00
Los Angeles, Calif. (f)	....	7.50–9.50	7.50–9.50	8.50–10.00	9.00–11.00	....	9.00–11.00	....	29.00–34.00	....	....	....	....
Medicine Lodge, Kan.	1.70	4.00	....	....	....	....	....	....	15.00	....	....	15.00	20.00
Oakfield, N. Y.	2.50	....	....	5.50	6.00	6.00	....	5.50	....	....	....	15.00	25.00
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	....	20.00	30.00
Portland, Colo.	....	....	....	10.00	....	....	....	....	....	....	....	....	....
San Francisco, Calif.	....	....	9.00	13.40	14.40	....	15.40	....	....	....	....	....	....
Seattle, Wash.	....	10.00m	10.00m	13.00m	....	....	14.00	....	23.00	....	....	....	....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	....	....	....	....	20.00d	25.00e	33.00

NOTE—Returnable bags. 10c each; paper bags, 1.00 per ton extra (not returnable. (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (d) ¼x48x36 in.; (e) ⅜x48x36 in.; (f) plasterboard 18c to 20c per yd.; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail 35.00.

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00		
Cement City, Mich.		5x8x12–55.00¶	
Chicago District‖	180.00–210.00a	230.00–260.00a	280.00–330.00a
Columbus, Ohio	13.00		
Detroit, Mich.	.15– .17†		.24–.26†
Forest Park, Ill.	21.00*		
Grand Rapids, Mich.	11.00*		
Graettinger, Iowa	.18– .20		
Indianapolis, Ind.	.10– .12a		
Los Angeles, Calif.	4x8x12–5.00*		
Olivia and Mankato, Minn.	9.50b		
Somerset, Penn.	.18– .20		
Tiskilwa, Ill.	.16– .18†		
Yakima, Wash.	20.00*		

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	
Chicago District "Haydite"	14.00	
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	
Ensley, Ala. ("Slagtex")	12.50	
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.		37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	
Milwaukee, Wis.	14.00	30.00
Mt. Pleasant, N. Y.		14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	
Philadelphia, Penn.	15.50	
Portland, Ore.	17.50	23.00– 55.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	18.00	30.00– 40.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	

*40% off List.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened 200 mesh, $7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton.
Granville, N. Y.—Red, green and black, $7.50 per ton.
Pen Argyl, Penn.—Blue-black, bulk, $6.50 per ton.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Oxford gray Buckingham	14.62	18.13	23.40	26.33	32.14	40.95
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Gen. mediums	9.50–11.25					
No. 2 ribbon	6.75– 7.25					
No. 1 Albion clear	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Albion mediums	8.00– 9.00					
Chapman Quarries, Penn.—No. 1	8.75–11.25					
Medium	7.75– 9.00					
Hard vein		16.00	23.00	26.00	32.00	40.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00				
Pen Argyl, Penn.*						
Graduated slate (blue)		16.00	23.00	27.00	37.00	46.00
Graduated slate (grey)		18.00	25.00	29.00	39.00	48.00
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00					
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50					
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*10% discount to roofer; 10%–8⅓% to wholesaler.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Cicero, Ill.—French and Spanish, 8x15, per sq., red, 11.50; green	13.50
English 7½x15½ per sq., red 18.00; green	20.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60
Pasadena, Calif. (Stone Tile):	
3½x4x12, per 100	3.00
3½x6x12, per 100	4.00
3½x8x12, per 100	5.50
Tiskilwa, Ill.;	
8x8, per 100	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M	50.00
3½x8x12, per M	60.00
Prairie du Chien, Wis.:	
5x8x12, per M	82.00
5x4x12, per M	46.00
5x8x6 (half-tile), per M	41.00
5x8x10 (fractional), per M	82.00
Yakima, Wash. (Building Tile):	Each
5x8x12	.10

Cement Building Tile

Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	14.00
8x 8x16, per 100	22.00
8x12x16, per 100	30.00
Columbus, Ohio:	
5x8x12, per 100	6.50
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00
Waukesha, Wis.—Drain tile, per ton	8.00

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20		1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert					.95	1.25	1.60			2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich. (b)				.60	.70	.90	1.20			1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas		.19	.28	.43	.55½	.90	1.30		1.70†	2.20							
Indianapolis, Ind. (a)				.75	.85	.90	1.15			1.60		2.50					
Longview, Wash.							Sewer pipe 40% off list; culvert—list										
Mankato, Minn. (b)										1.50	1.75	2.50	3.25	4.25			
Newark, N. J.							6 in. to 24 in., 18.00 per ton										
Norfolk, Neb. (b)				.90	1.00	1.13	1.42			2.11		2.75	3.58		6.14		7.78
Olivia, Mankato, Minn.							12.00 per ton										
Paullina, Iowa‡								2.25		2.11		2.75	3.58		6.14		7.78
Somerset, Penn.					1.08	1.25	1.65			2.50		3.65	4.85	7.50	8.50		
Tiskilwa, Ill. (rein.)				.75	.85	.95	.70	1.55									
Tacoma, Wash.	.15	.17	.22	.30	.40	.55	.70										
Wahoo, Neb. (b)					.85½		1.14			1.81		2.47	3.42	4.13	5.63	6.49	7.31
Yakima, Wash.							1.42			2.11		2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths. (b) Reinforced (c) Delivered on job; 5% discount, 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

House Ways and Means Committee Hears Arguments for Cement Tariff

THE committee on ways and means of the House of Representatives at Washington, D. C., gave a hearing to portland cement manufacturers on February 20. A tariff of 22 cents a hundred weight was urged by G. S. Brown, president of the Alpha Portland Cement Co., Easton, Penn. Mr. Brown declared that for several years the American cement industry had been suffering as a result of imports, principally from Belgium, with which it could not compete.

Mr. Brown's statement of the condition of the industry was disputed by W. M. Richardson, of Philadelphia, chairman of the cement importers' committee, who asserted a tariff would create a monopoly of American producers, resulting in increased costs to consumers. He said that the imports of portland cement amount to less than 2% of the cement used in the United States, and could not possibly constitute serious competition.

Complaint by Mr. Brown that cement makers operated at a loss so far as eastern seaboard markets were concerned, and that the American producers were unable to meet the Belgian price even though they sold their product below cost in Atlantic and gulf ports was denied by Mr. Richardson.

The Alpha Portland Cement Co. head asserted that it costs from 38c. to $1.16 more to deliver a barrel of American cement at the seaboard than to deliver Belgian cement. He also said that production costs 73c. a barrel more in this country than in Belgian mills.

While European competition began to menace American producers in 1923, Mr. Brown asserted that modernization of plants, and economies in operation which resulted in 60% better labor results than in 1914, still left the Americans at a disadvantage, and he contrasted wage and living standards of the United States and Belgium

Complaint that the Florida Portland Cement Co.'s plant lost money on local business last year was met by testimony showing dividends by other corporations.

Mr. Richardson claimed that the Lehigh Portland Cement Co., since its organization in 1889, has paid regular cash dividends of 6%; has distributed 473% in common stock dividends valued at $17,748,150, and in 1928 paid a 100% dividend of 7% preferred stock valued at $22,517,400.

L. E. P. Giffroy, New Orleans importer, supported Mr. Richardson's statements, and charged that an American monopoly existed.

E. R. Hollander, New York importer, asserted that imports in New York last year amounted to not more than 100,000 bbl., while American producers shipped from 8,000,000 to 10,000,000 bbl. to New York market.

"They say there is no arrangement about prices," he observed. "Then why is it that the price everywhere is uniformly $2.43 a barrel to dealers, or $1.83 net?"

Cost of labor in foreign production, he said, represents about 7 or 8 c. a barrel, while labor cost in American production is only 15c. a barrel, Mr. Hollander said.

The New York importer claimed that the market for Belgian cement is limited to 10 or 12 miles inland, because of prohibitive freight rates, which confine the movement to trucking.

T. S. Adams, Yale university statistician, upheld the cement producers' claim of a wide difference between American and Belgian production costs.

He declared that Belgium encourages export trade and makes discounts in railroad rates for shipments abroad.

Mr. Adams was unable to give the ocean freight rates on Belgian cement. George V. Booker, Tampa, Fla., importer, told the committee that the rate was 60c. per barrel.

Mr. Booker asserted that the cement industry was meeting competition in Tampa at $1.80 a barrel, while in the interior, where imported cement was at a disadvantage, American cement was being sold at $1.65 a barrel.

The Tampa importer charged that the Florida Portland Cement Co. plant was poorly located, and over-capitalized, in reply to Mr Brown's complaint that it lost money on local business last year.—*Birmingham* (Ala.) *Post.*

Hercules Portland of Los Angeles Changes Name to Paramount Portland and Makes Plans for New Plant

THE Hercules Portland Cement Co., of Los Angeles, Calif., has recently announced that the company's name has been changed to the Paramount Portland Cement Co. This company is at present preparing plans for a new $2,500,000 cement plant to be located at Torrance, Calif., not far from Los Angeles. H. H. Helbush, of H. H. Helbush and Company, real estate and investment brokers of Los Angeles, is head of the Paramount company and G. S. Moore is manager.

W. H. Cleary, Detroit engineer, has arrived in California and will supervise the construction of the new plant. According to present plans the first unit will have a capacity of 5000 bbl. per day and will be arranged so that a second unit can be added at a later date to bring the construction up to 10,000 bbl. When the second unit is complete, the plant will represent an investment of $4,000,000. Special care will be taken to make the plant as dustless as possible. Actual breaking of ground is expected within a month.

The site for the plant is a tract of more than 100 acres on Redondo boulevard. It is claimed that the deposits there are among the finest in the world for the making of cement, and that there is sufficient material on hand to keep the plant running regularly for 70 years. It is now planned to have the administration building and several of the mill buildings of the new Paramount plant facing on Redondo Blvd., but set back 100 ft. with the approach artistically landscaped.

Pacific Coast Cement Co. Mill Begins Shipments

FEBRUARY 22 the Pacific Coast Cement Co., Seattle, Wash., shipped its first car of cement in the presence of the mayor and other distinguished guests. Wylie Hemphill, vice-president and sales manager, is quoted as saying that 50% of this year's capacity of the plant has already been booked. Seattle newspapers gave the opening much publicity.

Accumulated Errata!

IN the February 2 issue of ROCK PRODUCTS in the article entitled "Gypsum Producers Discuss Tariff at Hearing," on page 113, it was stated that Thomas F. Breen of the Cardiff Gypsum Plaster Co. said that his company was the only "independent" plant in the locality of Fort Dodge, Iowa. Newspaper accounts of the hearing gave the statement in this fashion, but Mr. Breen has since written that what he said was that the Cardiff company was the only independent company that remained outside of the combination at the time the United States Gypsum Co. was formed. Other mills have been built at Fort Dodge since the formation of the U. S. Gypsum Co.

V. J. Milkowski, engineer for the Morris Machine Works of Baldwinsville, N. Y., writes concerning the article on "Diesel Engines" by Orville Adams in the February 16 issue of ROCK PRODUCTS. Mr. Milkowski states that the drawing on page 52 of that issue, entitled "Fig. 5, cross section and deck layout of a typical, oil-engine-driven river dredge," shows the arrangement of a 12-in. dredge which the Morris Machine Works furnished to the Peninsula Development Co. of Tampa, Fla. Notation as to the source of this layout would have certainly been made at the time of the publication of the article if it had been known at that time.

In the 1928 Annual Review and Directory Number, in an item on "Water Softening," on page 151, the product of Sofnol, Ltd., of London, England, termed "Sofnolite," is described as being a special water softening compound. This is an error, as "Sofnolite" is a special analytical material manufactured for the quantitative determination of CO_2, and takes the place of the ordinary liquid potash bulbs, according to a letter from the English concern.

New Machinery and Equipment

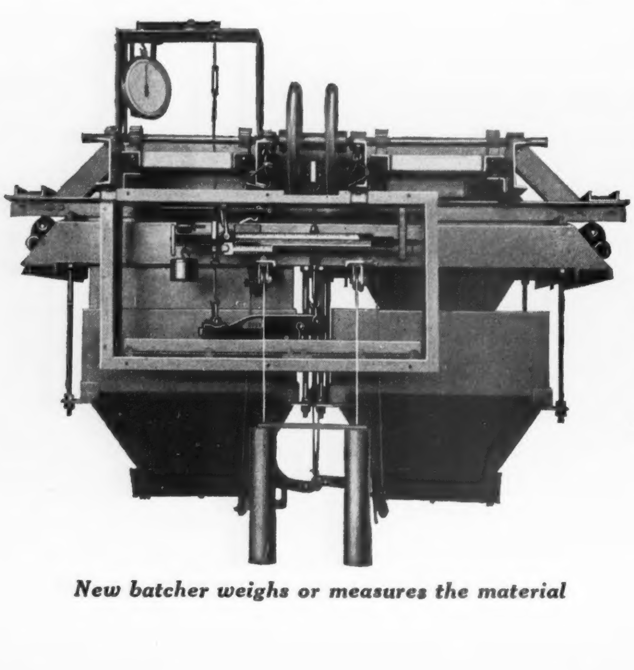
New Volume-Weighing Aggregate Batcher

THE Erie Steel Construction Co., Erie Penn., has recently brought out a new volume weighing "AggreMeter." This unit is suitable for installation on almost any type of bin that is on the market, thus making it possible to bring old loading equipment up to date so that accurately weighed and measured batches are obtainable.

The "AggreMeter" can be used for weighing and for measuring by volume, one after the other. The units have ample capacity for the usual demand, the capacities of the boxes by volume being as follows: sand, 9 to 19¼ cu. ft.; stone, 10.2 to 29 cu. ft. The beam scale has a capacity of 5000 lb. Besides these, larger capacity units can be furnished if necessary.

According to the manufacturer, all operating members are directly in front and in full view of the operator. The draw-off doors close automatically after the material is dumped. Either of these doors can be opened separately, or both can be operated at the same time. The gates are operated by rack and pinion and are claimed to work easily and smoothly, and not to jam. It is stated that a batch of sand and stone can be weighed or measured and dumped in thirty seconds.

This unit is shipped complete so that no assembly is necessary in the field, making it particularly convenient for installation. The manufacturer claims that the entire unit is made of the best of materials and put together to give years of uninterrupted service. The company also guarantees the successful operation of this equipment.

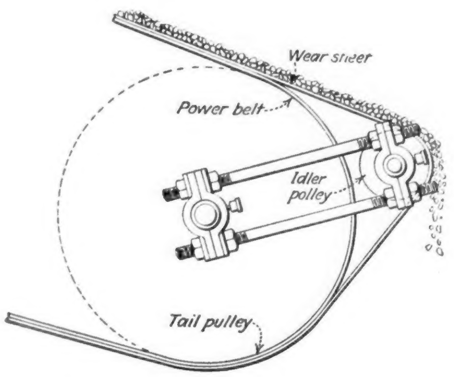


New batcher weighs or measures the material

New Double Belt System of Conveying

A NEW system of belt conveying, known as the "Duplex," is being introduced by the Boston Woven Hose and Rubber Co., of Cambridge, Mass. Briefly, this system consists of the use of a wear sheet or pad upon the conveyor belt, so that the inside belt merely serves to transmit power while the wear sheet carries the load and takes the abrasion.

Since the wear sheet is only carried on the inside belt, it is obvious that it does not have to carry any working tension, and hence its life is claimed to be much greater than the ordinary style belt which is used for both power transmission and carrying the load. Another factor in increasing the life is the fact that the carrying belt is made largely of rubber. It is manufactured in various thicknesses up to 1 in., depending upon the service, and is made of pure gum rubber stock with two plies of duck inserted. One of these plies is located at the inside face next to the power belt, while the other is at the center. It is claimed that this construction allows extreme flexibility but prevents stretching.



Use of a separate wear sheet for reducing the drop of material

The manufacturers state that the power belt, because it does not have to combat abrasive action of materials, will outlast three of the wear sheets. The company states that in one installation the saving through the use of the "Duplex" system was 33⅓% in conveying cost over the former installation which used standard 6-ply rubber covered belt only.

Another feature of the "Duplex" system is the possibility for cutting down the drop of the material as it comes off the end of the belt. The illustration shows how it is possible to run the wear sheet over an idler pulley at the tail, thus permitting the receiving chute to be placed much closer underneath the belt and doing away with much of the drop, which thus eliminates considerable breakage, especially in plants handling hot materials, such as in cement and lime operations. Wear sheets manufactured with asbestos cloth and a special heat-resisting compound can be had, and the company claims these are satisfactory for handling hot materials up to 500 deg. F.

The manufacturers claim the following advantages for this system of conveying: Saving in conveying costs, saving in installation costs because of the possibility of using smaller sizes of head and tail pulleys, increased life for power transmission belt, ease of replacement, possibility of troughing at any angle up to 45 deg. without injury to the wear sheet, saving through the use of a narrower power transmission belt than would be necessary to carry the load, and less breakage of material.

New Line of Locomotive Cranes

LINK-BELT COMPANY, Chicago, Ill., has announced a complete line of locomotive cranes designed especially for gasoline-engine, Diesel-engine or electric-motor drive, to be known as the "L" type cranes.

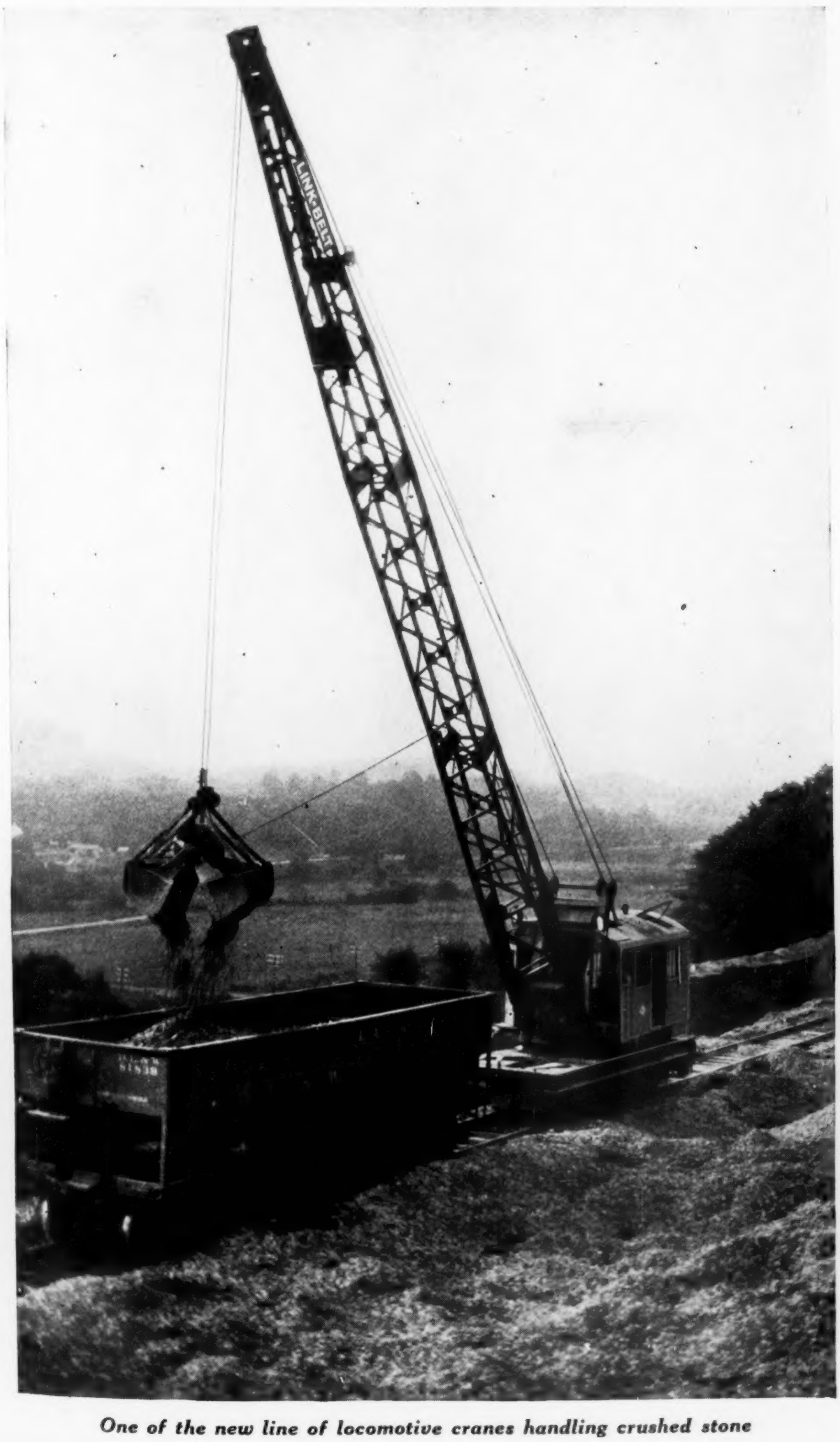
Detail view of new gasoline crane

These units are not merely modified steam cranes, but are designed throughout for the entirely different and much more severe conditions imposed by a power unit running continuously at its full operating speed, ac-

cording to the manufacturer.

The machinery and its arrangement are particularly adapted to direct engine or motor drive, and all clutches, brakes, shafts, bearings and gears are oversize in order to give the best operating results and the lowest possible maintenance expense, under these conditions, the announcement states. The drive from engine or motor is a totally-enclosed silent chain drive, and all upper frame gears have machine cut teeth, cut from solid blanks.

The unit is furnished with a two-speed travel gear to give a high travel speed for traveling light, and a slower travel speed for pulling heavy loads or ascending comparatively steep grades. The two-speed travel gear in no wise affects the other speeds of the machine (hoisting, boom hoisting and rotating), which should, under all conditions, remain unchanged in order not to affect the operating speed and handling capacity of the machine. The addition of the "L" type crane in five sizes now gives Link-Belt Co. a complete line of gasoline, Diesel, electric and steam locomotive cranes.



One of the new line of locomotive cranes handling crushed stone

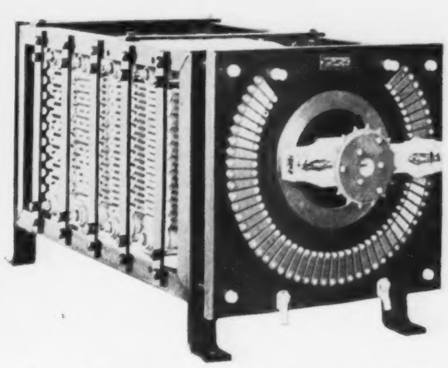
New Radial Switches with Renewable Segments

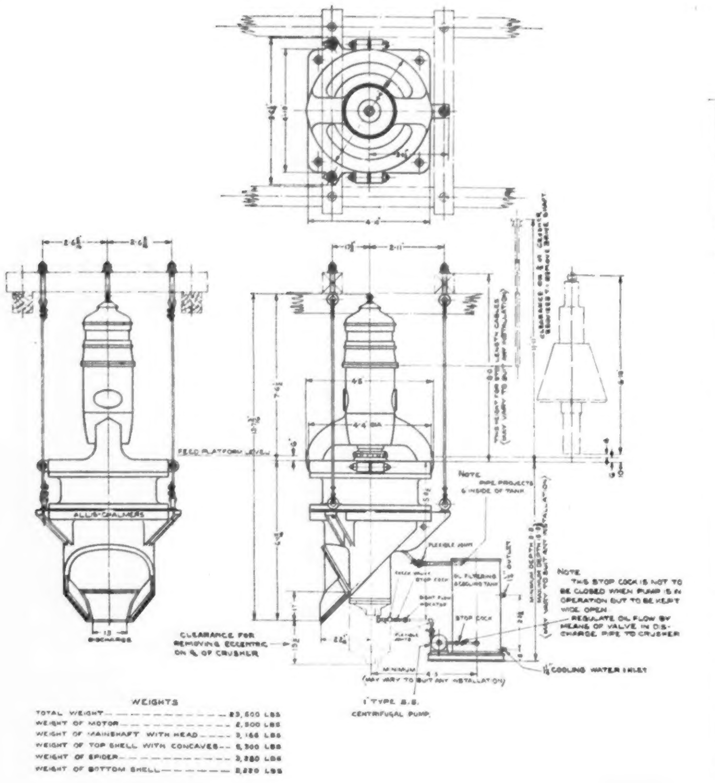
A COMPLETE new line of radial rheostat switches, for varying the fields of large electric machines such as generators, motors, etc., has been announced by the General Electric Co., Schenectady, N. Y. The switches are for general application where the current is more than 50 amperes and not over 300 amperes. There are five forms, for hand, sprocket, gear, solenoid and motor operation. These bear the designations CR-8090, CR-8190, CR-8290, CR-8390 and CR-8490, respectively.

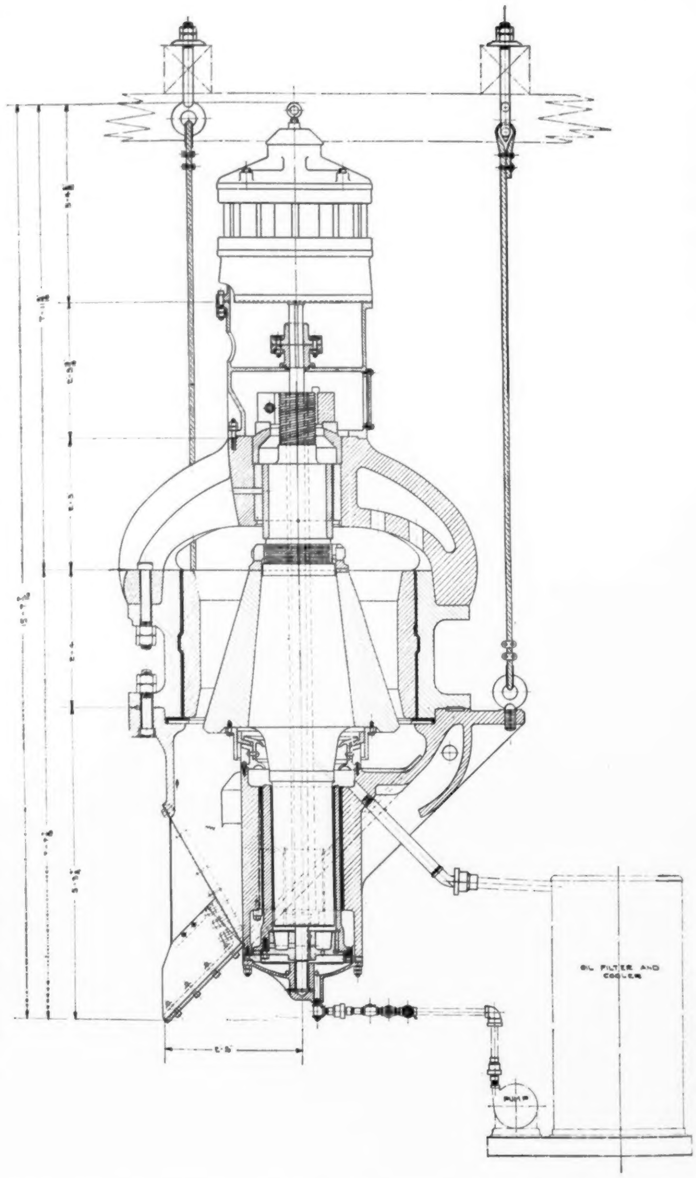

Motor-operated, renewable-segment, dial switch

The outstanding advantage of the new switches is the fact that they have renewable segments, the announcement states. By removing two screws any segment may be taken off without disturbing the resistor leads. The segments may be reversed.

The switch designed for 100-ampere service has 65 divisions, while the 200-ampere switch has 48 divisions, and the 300-ampere switch has 40. All switches of a given current rating have the same number of divisions, irrespective of how they are operated. Thus, if the user wishes to change from a sprocket-operated switch to a solenoid- or motor-operated one, he can exchange the switches and reconnect the leads, having the same number of governing points. For the smaller hand- or sprocket-operated devices, a 50-division switch is available.


Sprocket-operated field rheostat with renewable segments





Above, left—Installation drawing for the new 7-in. gyratory crusher with vertical motor. Right—Sectional view of the 10-in. crusher showing details of its suspension and vertical motor installation

New Line of Gyratory Crushers

ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis., has brought out a new style of gyratory crusher which differs in many details from the usual crusher. The company states that the new "Newhouse" gyratory, which is designated as the Style "B," has been in the process of development for several years and represents the result of years of careful experiment under actual operation in several plants with varying conditions of operation including the crushing of limestone, trap rock, gravel and copper ore. The manufacturers claim for this unit maximum production per dollar invested, minimum power requirements, and the minimum number of working parts. Other features include the absence of all gears and belts, ,reversible concaves, extra room under head above diaphragm, steep diaphragm insuring perfect discharge, low oil consumption, ease of installation, absence of expensive foundations, and maximum size feed compared to receiving opening.

The "Newhouse" crusher is without the usual bevel gears and drive pulley, the eccentric being revolved by a direct connection to a vertical motor located on top of the spider. This connection is accomplished by an extension of the motor shaft which passes through the hollow bored main shaft and is keyed directly to the eccentric through a drive plate which forms the bottom of the eccentric. Thus it will be noted that the eccentric revolves and the crusher head gyrates at the same speed as the motor. Various crusher speeds have been tried out and experience has indicated that the most efficient speeds vary from 860 r.p.m. for the smaller units to 475 r.p.m. for the larger crushers. The throw of the head depends upon the size product for which the crusher is built, and is designed to produce the maximum of that size. Lubrication is provided for the eccentric by means of a convenient combination filter, cooler and tank placed near the crusher. The filtered oil is pumped to the eccentric by a small motor-driven centrifugal pump, and is returned by gravity. Flexible connections are made between the crusher and the oiling system.

Unlike previous crushers, an expensive permanent foundation is not required for the "Newhouse" crusher, as it is suspended from the crushing plant structure by means of these cables. The unit is self-contained with the discharge spout, allowing crushed material to be fed direct to elevator or conveyor without additional chutes.

The main shaft is suspended by a device similar to the company's large size style "K" crushers. There is no movement at the fulcrum point and the thrust is taken in a spherical bearing located under the suspension nut. The adjustment of the crushing head to compensate for wear and to alter the size of the product is accomplished by raising the head, the upper part of the main shaft being threaded for the suspension nut.

The spider is of the two arm type with sufficient height to give ample room for feeding the largest pieces of stone or ore which can be passed into the crusher chamber, the company states. The top shell is bored vertically and fitted with either chilled iron or manganese steel concave, as required by the material to be crushed. The main shaft is of high carbon, heat-treated steel, and the eccentric is made of special metal babbitted on the inside for the main shaft and highly polished on the outside.

The "Newhouse" crusher is made in three sizes—7 in., 10 in., and 14 in. The manufacturer claims that the high speed of gyration produces a remarkable crushing action, and that the peculiar action of this crusher permits the feeding of larger stone to the unit than can be fed to the standard crusher with the same opening. The driving motor supplied with each crusher is a standard Allis-Chalmers vertical induction motor of the squirrel-cage type.

New Line of Geared Motors Being Introduced

A NEW and interesting speed reduction device has recently been developed in Sweden by the Luth and Rosen Co. It consists essentially of an electrical motor and a precision gear combined in one unit.

The gear and the motor are built together in one casing as the first illustration shows. It may be seen that all shafts and bearings are located in the same horizontal plane. The construction of the motor is such that it can be put into the casing without any difficulty, it is claimed.

The helical gears are made of tough chrome nickel steel and are cut with the highest possible precision, it is stated. The gears run in oil, and the casing is oil tight. All bearings are SKF ball bearings. Through a special spring construction in the intermediate gear wheels, the gears are always in perfect mesh, the manufacturer states.

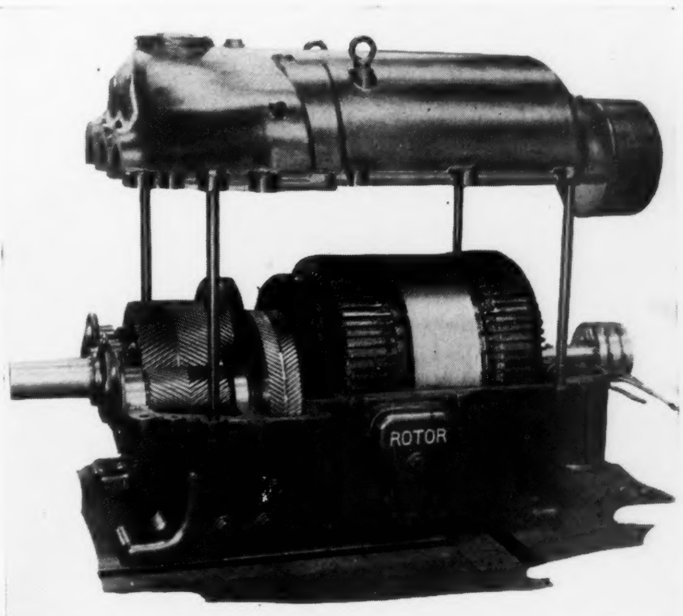
To date this type of gear motor has been standardized from 5-hp. to 500-hp., with two maximum ratios, which are 1 to 14½ and 1 to 30. As the motor can be chosen for any synchronized speed, it is possible to obtain any desired reduction within these ratios. It is claimed that the gears themselves have very high efficiencies, being 99% for the single reduction, 98% for the double and 97% for the triple reduction. Since the gears operate in oil and has practically no wear, it is claimed that the above high efficiencies are maintained.

The motor, being of high speed design, has a good power factor as compared with low speed motors and is less expensive, according to the manufacturer. The gear box is dust proof and the motor is totally enclosed, thus assuring a long life for the unit, as the abrasive dust and dirt cannot enter and wear out the vital parts.

The gear motor has found many uses and is now said to be in general use in Europe for such installations as drives for ball mills, rotary kilns, compressors, conveyors, etc.

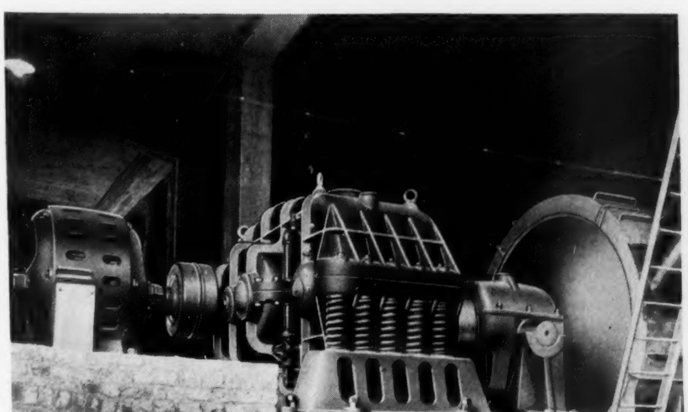
Luth and Rosen Co. has also developed a line of precision gears for single, double and triple reductions. One of the illustrations shows an installation of a double reduction gear driving a ball mill. The motor runs at 735 r.p.m., and the 450-hp. gear reduces this speed to 17 r.p.m. In this case, the gear is arranged for co-axial drive and is balanced on springs.

The Arenco Machine Co., Inc., 25 West 43rd street, New York City, has been appointed the exclusive representative for L. & R. products in the United States.

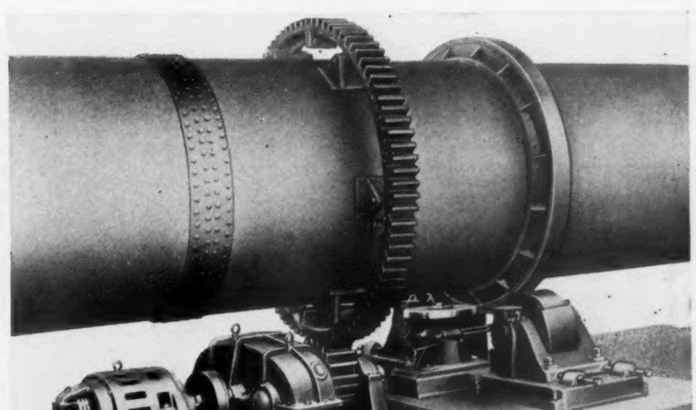


Three-phase, helical geared motor of 75 hp. and 150 r.p.m. with the upper half of the casing removed

Installation of three 2-phase, 20-hp., geared motors in the plant of the Atlantic Gypsum Products Co.



Co-axial drive, double reducing gear driving a ball mill in a Belgian cement plant; reduction 735 to 17 r.p.m.



Three-phase, helical geared motor and double precision helical gearing on a Belgian cement kiln; 107 to 7 r.p.m.

News of All the Industry

Incorporations

Granite Corp., Saint Paul, Va., $10,000.

Neal-Roberts Gravel Co., Inc., Monroe, La., $50,000.

Mercedes Concrete Pipe Co., Mercedes, Tex., increase $50,000 to $76,000.

Liberty Hill Quarry, Inc., Liberty, N. C., $50,000. G. W. Crouse, J. B. Ross.

Blue Ridge Lime and Stone Corp., Ashford, N. C. R. Noale, J. A. Sinclair.

Nick Innocenzi and Sons, Inc., Trenton, N. J., $100,000. Deal in sand and gravel.

Rickman Cement Products Co., Eau Claire, Wis., $50,000. E. Rickman, M. Peterson, V. Stolts.

Burleigh Sand and Gravel Co., Wildwood Crest, N. J., $125,000. Palmer M. Way, Wildwood, N. J.

Concrete Products Co., Miami Beach, Fla., 240 shares, par $25. W. C. Ensign, Jno. Ramsey, H. W. Thomas.

Elkhart Sand and Gravel Co., Elkhart Lake, Wis., name changed to **Elkhart-Moraine Sand and Gravel Co.**

Cuba Trap Rock Corp., Wilmington, Del., $1,000,000. J. M. Frere, J. A. Frere, C. R. Murphy (American Guaranty and Trust Co., Wilmington, Del.).

Concrete Supply Co., Winston-Salem, N. C., $100,000. S. S. Scott, Woodleaf, N. C.; R. H. Wright, Jr., Asheville, N. C.; J. S. Manning, Raleigh, N. C.

Ontario Sand and Gravel Co., Geneva, N. Y., $50,000 preferred and 1500 shares common, no par. Lapham, McGreevy and Ryan, attorneys, Syracuse, N. Y.

Mobile Ready Mixed Concrete Co., Inc., Mobile, Ala., $10,000. E. W. Bullock, Birmingham, Ala., president; R. W. Greene, Jr., Mobile, Ala., secretary; R. C. Greene, Sr., Mayfield, Ky., vice-president.

George H. McLeod Corp., North Hempstead, Long Island, N. Y., a consolidation of George H. McLeod Corp., and Hunt-Drury Gravel Corp., $100,000 preferred and 5000 shares common, no par. H. H. Fowler, Mineola, N. Y.

Clearwater Lime Products Co., Limestone, Idaho, $500,000. To produce lime and lime products. Walter Harr, Portland, Ore., president; Elmer Harr, Portland, Ore., and Orofino, Idaho, vice-president; L. A. Strickfadden, Orofino and Lewiston, secretary-treasurer.

Standard Materials Corp., 1010 Pine St., St. Louis, Mo., $4,500,000. To take over sand and gravel operations of Missouri Portland Cement Co., Mississippi River Sand and Material Co., St. Charles Sand Co., and the retail facilities of the Missouri Portland Cement Co., Conrad Besch, president.

Northern Concrete Construction Co., Chicago, Ill., has been incorporated for $60,000 to carry on the business of the former partnership of Recktenwald and Ball, cinder concrete block manufacturers, Commonwealth Ave. and 24th St. The officers are Arthur L. Ball, president; John N. Recktenwald, vice-president; W. H. Kestin, secretary and treasurer.

Quarries

St. Louis Rock, Sand and Gravel Co., Golconda, Ill., developing quarry south of Golconda.

Colorado Fuel and Iron Co., Pueblo, Colo., has taken over the Monarch limestone quarry near Garfield, Colo., for furnishing limestone flux.

Rockwood-Alabama Stone Co., Rockwood, Ala., producers of dimension stone, principally, is making a $500,000 extension to its plant.

Mueller-Gray Quarry Co., Perryville, Mo., is reported to be establishing a new quarry at the south end of Perryville.

Missouri Pacific R. R. is reported to have purchased quite a tract of land north of Garnett, Kan., along the K. N. & D. R. R., and will, as soon as possible, establish an extensive rock crusher.

Danville, Va. Under the injunction decree handed down by Judge Henry C. Leigh it was held that the city has the right to lease the rock quarry but not to invest public funds in land.

Marengo Crushed Stone Co., Marengo, Ind., is reported to have purchased the property of the Globe Construction Co. and to be contemplating the erection of new buildings and additional equipment.

Arnold Stone Quarry, Ste. Genevieve, Mo., has begun operations preparatory to quarrying and shipping rip-rap for river improvement and other work, and a large force of men will be put to work as soon as possible. Ray Stewart, superintendent, will be in full charge.

Mid-West Crushed Stone Co., Indianapolis, Ind., is making a number of improvements at its Ridgeville, Ind., plant. In the power plant the steam plant is being taken out, and they are installing 390-hp. Buckeye Diesel type engines. One 260-hp. Buckeye engine will operate their main line shaft, and a 130-hp. engine of the same make will be direct connected to generator to furnish electricity for pumps, lights, etc.

Lithonia Granite Co., Collinsville, Ga., one mile east of Lithonia, has torn down its old rock crusher and is now constructing one with a much larger capacity than the one it has been using. These improvements, together with the ones now being put in operation at Rock Chapel Mountain by the Consolidated Quarries Corp., indicate that the coming season will be a much busier one than the city of Lithonia has as yet experienced.

Carbon Limestone Co., Hillsville, Penn., is working double shift at the present time in order to keep up with the demand for its product. Much of the limestone being quarried is being shipped to the Jones and Laughlin Co. steel plants in Aliquippa, while there is also a considerable demand for road materials, with the result that this concern is enjoying unusual prosperous working conditions at the present time. Other industries of the district are also working good and conditions generally are very good in the Hillsville district.

Dolomite, Inc., Cleveland, Ohio, has begun work on the new 600-ft. dock being constructed in front of its present dock at its Sturgeon Bay, Wis., plant. The work is in charge of Whitney Bros. of Duluth. This plant of Dolomite, Inc., was formerly owned by the Sturgeon Bay Co. A new 60-in. shuttle will be installed, which will eliminate all the old spouts and will enable the loading of boats three times as fast as in the old way. The shuttle also enables the company to load larger boats.

Sand and Gravel

Richwood Gravel and Sand Co., Marysville, Ohio, has sold its plant and properties to the **Marion Sand and Gravel Co.**, Marion, Ohio.

Northport Sand and Gravel Co., Smithtown, Long Island, N. Y., has asked permission of the village to dredge sand and gravel from the bed of the Nissequogue river.

Blue Rapids Sand and Gravel Co., Blue Rapids, Kan., is opening another gravel pit and installing equipment to cost $20,000. Ed. Grundeman is president. The equipment includes a steel dredge equipped with a Swintek screen nozzle.

Henry Steers, Inc., 17 Battery Place, New York City, is the name of the organization which will continue the business of producing sand and gravel. The engineering and construction departments of the organization have been separately incorporated as J. Rich Steers, Inc., 17 Battery Place.

Richmond Sand and Gravel Co., Richmond, Va., affiliated with Norfolk Sand and Gravel Co., Norfolk, Va., is said to be planning new sand and gravel storage and distributing plant to cost more than $250,000, including conveying, loading and other equipment.

Bedford-Nugent Sand and Gravel Co. of Evansville, Ind., entered into a contract with the Union Fiscal Court, Morganfield, Ky., recently for the privilege of removing gravel from the thread of the Ohio river to the low-water mark on the Illinois shore. The Evansville company agreed to pay the county $500 a year for this privilege, and the contract extends over a period of five years.

W. A. Todd, Dunbarton, S. C., well-known gravel pit operator, is planning to open up a 40-acre pit near there within the next two weeks, according to an announcement made by Mr. Todd himself. Railroad tracks are now being put down to the gravel pit and machinery for operating the plant will be installed as soon as special side track is completed. The owner of the property will install facilities for loading 25 carloads of gravel, said to be of high quality, daily. Mr. Todd advises that he has procured a contract already for 80,000 tons of the gravel.

Pine Bluff Sand and Gravel Co., Pine Bluff, Ark., re-elected F. Lee Fox president; W. P. McGeorge, vice-president and treasurer, and Miss Theresa Scheu, secretary. The annual meeting was held in the new office building recently completed by the company at the corner of East Barraque and Nebraska Sts. Reports made by officials of the company showed that the business of the organization saw a substantial growth during the last year and it was voted to make extensive improvements on the plant and equipment in 1929, which will include additional equipment at the plant, also in the river department.

Gypsum

Best Bros. Keene's Cement Co., Sun City, Kan., is making extensive improvements and additions at the quarry plant. The power house building has been completed, the Fairbanks-Morse Diesel engine installed, and the General Electric Co. switchboard, generator and other parts of the electrical equipment put in place. The steel storage bins are in place and all concrete work and framing finished for the new crusher house.

American Gypsum Co., Port Clinton, Ohio, employes met at a "booster banquet" recently in honor of their new operating manager, Fred Wolfe, and to show him their loyalty and co-operation. After a sumptuous dinner Mr. New, the chief chemist, acted as toastmaster. In his talk Mr. New outlined the purpose of this get-together banquet and, in behalf of the men, pledged their full support and loyalty to Mr. Wolfe. Mr. New then called on various ones for a speech, and appropriate ones were given. Fred Wolfe, the newly appointed operator of the company's plants, located at Port Clinton, Detroit and Cleveland, in his response clearly stated his standing with his men and their relationship to their firm, of his policy and his good will towards everyone, and the rousing cheers and hip, hip, hurrah! he received when he finished his speech gave evidence of his co-workers' loyalty. Mr. New read a letter he received from John A. Kling, general manager and chairman of the executive committee of the board of directors of the American Gypsum Co., in which he extended his best wishes for the success of the booster banquet, gave his promise to stand behind Mr. Wolfe, and that he wished to be considered as one of the operators. He also expressed his wish that the personnel and employes be one large family and not an organization with bosses. A letter received from the office girls was also read, as well as a number of telegrams of congratulations.

Cement

Colorado Portland Cement Co., Portland, Colo., mill, it is reported, has resumed operation after a shutdown dating from December 23.

Arizona; bills have been introduced in both houses of the state legislature to provide for a state cement plant to be operated by convicts.

Southern Cement Co., Birmingham, Ala., has let a contract for a $40,000 addition to its "Magnolia" brand slag-cement plant to the Burrell Engineering and Construction Co., Chicago, Ill.

Atlas Portland Cement Co. has opened sales offices for the Atlas Portland Cement Co. of Texas in the Amicable Bldg., Waco, Tex. C. H. Brice is sales manager; M. H. Hull is assistant sales manager, and E. C. Dippel, office manager.

Lone Star Cement Co. of Alabama, Birmingham, Ala., had an explosion of dynamite in a storage building at its quarry, February 22. No one was injured. A driller who was in the quarry at the time was showered with rock and debris but was not hurt.

Monarch Cement Co., Humboldt, Kan., elected the following officers for the coming year: H. F. G. Wulf, president; A. C. Kreitzer, vice-president; Fred H. Rhodes, secretary-treasurer. The information is made public that the Monarch is now competent to market and ship up to 1,500,000 bbl. of cement per year and that during 1928 it marketed 1,363,755 bbl.